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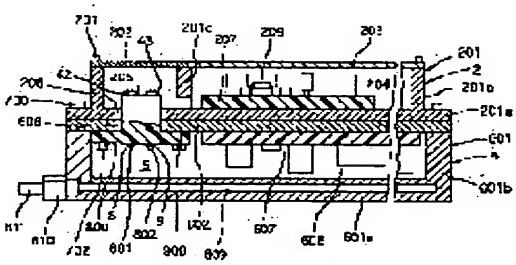
(54) POWER CIRCUIT MODULE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a power circuit module for electric vehicles, which has a reduced total wt. and space and is superior in cooling, reliability and replacement properties.
SOLUTION: This module comprises a first and second circuits 6, 2 formed as separate module units to which high currents are fed separately from a high-voltage battery. The first circuit module 6 has a cooling board (heat sink and heat-conducting member) 602 laminated on and integrated with a cooling board 201 of the second circuit module 2, thereby minimizing the thermal conductivity resistance between both the cooling boards 602, 201, one of which functions as an additional cooling board for suppressing the temp. rise, when one cooling board is more energized than the other board.



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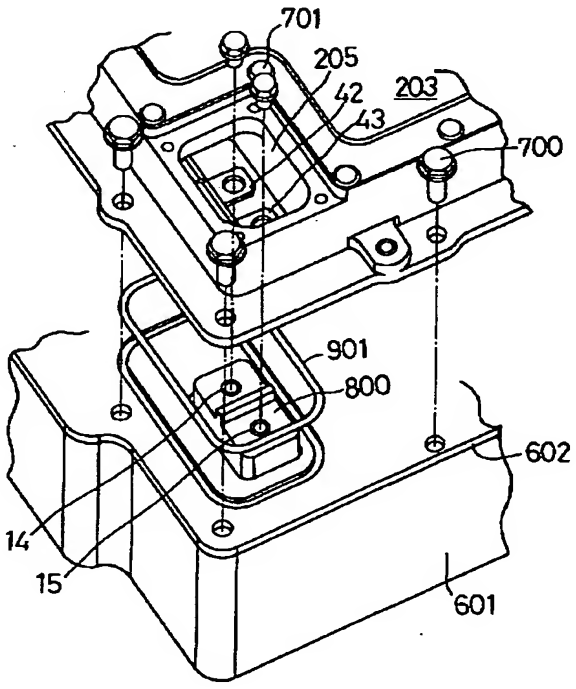
(54)【発明の名称】　電力用回路モジュール

(57)【要約】

【課題】全体重量及びスペースを低減でき、冷却性、信頼性、交換性に優れた電気自動車用の電力用回路モジュールを提供すること

【解決手段】高圧バッテリ１からそれぞれ高圧大電流を給電される第１回路部６及び第２回路部２は別々にモジュール化される。構成では特に、第１回路部モジュール６の冷却基板（ヒートシンク及び伝熱部材）６０２と第２回路部モジュール２の冷却基板（ヒートシンク及び伝熱部材）２０１が重ね合わされた状態で一体に結合される。これにより、両冷却基板６０２、２０１間の伝熱抵抗が極少となり、一方の発熱が他方のそれより優勢である場合には、他方の冷却基板がその発熱優勢な方の回路部のための追加の冷却基板として機能し、その温度上昇を抑止することができる。



【特許請求の範囲】
【請求項１】大容量の高圧バッテリから並列に給電されて異なる電力機器に出力する第１回路部及び第２回路部を備え、
前記両回路部は、
少なくとも一面が金属製の冷却基板からなるケースと、回路素子を搭載して前記冷却基板の内面に接合される絶縁基板と、前記ケースに収容されて前記回路素子に給電する一対の電源ラインとをそれぞれ備える電力用回路モジュールであって、
外面が互いに密接した状態で結合される前記両冷却基板に貫孔されて前記両ケースの内部空間を連通する連通孔と、前記連通孔を貫通して前記両回路部の内部電源ラインを接続する貫通型接続導体とを備えることを特徴とする電力用回路モジュール。
【請求項２】請求項１記載の電力用回路モジュールにおいて、
前記第１回路部側の冷却基板に固定されて前記連通孔を貫通する電気絶縁性の貫通型端子台を備え、
前記貫通型接続導体は、両端が前記ケースの両内部空間に露出した状態で前記貫通型端子台に囲覆、支持されて、一端が前記第１回路部の前記内部電源ラインに、他端が前記第２回路部の内部電源ラインに接続されていることを特徴とする電力用回路モジュール。
【請求項３】請求項２記載の電力用回路モジュールにおいて、
前記第２回路部側のケースは、前記貫通型端子台及び絶縁基板を囲む外周壁部と、前記貫通型端子台と絶縁基板とを隔てる隔壁部と、前記貫通型端子台を密閉する第１の蓋板と、前記絶縁基板を密閉する第２の蓋板とを備えることを特徴とする電力用回路モジュール。
【請求項４】請求項１乃至３のいずれか記載の電力用回路モジュールにおいて、
前記第１回路部側のケースは液冷され、前記第２回路部側のケースは液冷されないことを特徴とする電力用回路モジュール。
【請求項５】請求項１乃至４のいずれか記載の電力用回路モジュールにおいて、
前記連通孔と前記貫通型端子台との間に形成されて前記両ケースの内部空間を連通する呼吸孔を有することを特徴とする電力用回路モジュール。
【請求項６】請求項１乃至５のいずれか記載の電力用回路モジュールにおいて、
前記第１回路部は電気自動車用の走行モータ駆動用のＤＣ－ＡＣインバータモジュールからなり、前記第２回路部は電気自動車用の補機バッテリ充電用のＤＣ－ＤＣコンバータモジュールからなることを特徴とする電力用回路モジュール。
【請求項７】請求項１乃至６のいずれか記載の電力用回路モジュールにおいて、
前記連通孔は、前記両冷却基板間に介設されるＯリングによりシールされることを特徴とする電力用回路モジュール。
【請求項８】請求項１乃至７のいずれか記載の電力用回路モジュールにおいて、
前記両冷却基板は、電気導通可能に接触し、かつ、前記両内部電源ラインのうち低圧側の内部電源ラインを兼ねることを特徴とする電力用回路モジュール。
【請求項９】請求項４記載の電力用回路モジュールにおいて、
前記第１回路部側のケースは、前記第２回路部側のケースに接する側の部位に位置して冷却液通路を有することを特徴とする電力用回路モジュール。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、電力用回路モジュールに関し、特に電気自動車に適用される電力用回路モジュールに関する。
【０００２】
【従来の技術】内燃機関により駆動される発電機から高圧（たとえば３００Ｖ）の主バッテリや走行モータへ給電する従来のハイブリッド電気自動車では、主バッテリから給電されるエンジン始動用モータにより内燃機関が始動され、この始動用のモータとして上記発電機などを用いることができる。
【０００３】特開昭６２－１７３９０１号公報は、電気自動車の走行モーター給電用の主バッテリから補機給電用のＤＣ－ＤＣコンバータ（以下、ＤＣ－ＤＣコンバータモジュールともいう）を介して補機駆動専用の補機バッテリに給電することを提案している。このように補機バッテリを設けることにより、通常、低圧で給電される補機に比較して走行モータへ高圧給電できるので、損失低減、機器の小形化などの効果を実現でき、一方、補機へは電圧変動が少ない電源電圧を印加できるという利益が生じる。
【０００４】この種の補機バッテリ充電方式を採用する電気自動車用動力回路の従来例を図７に示す。１は主バッテリ、２６０はＤＣ－ＤＣコンバータ及びＤＣ－ＡＣインバータを内蔵するオールインワンモジュール、３は補機バッテリ、４は補機、５は補機バッテリ充電指令スイッチ、７は走行用モータである。
【０００５】図７では、高圧の主バッテリ１は絶縁被覆電源ケーブル８００、９００によりオールインワンモジュール２６０給電している。他の従来例を図８に示す。１は主バッテリ、２００はＤＣ－ＤＣコンバータモジュール、３は補機バッテリ、４は補機、５は補機バッテリ充電指令スイッチ、６００はＤＣ－ＡＣインバータモジュール、７は走行用モータである。
【０００６】図８では、高圧の主バッテリ１とＤＣ－ＡＣインバータモジュール６００とを結ぶ絶縁被覆電源ケ

ーブル８００、９００の途中に端子台１０００、１１００を設け、この端子台から絶縁被覆電源ケーブル１２００、１３００を分岐して、ＤＣ－ＤＣコンバータモジュール２００に給電している。他の従来例を図９に示す。

【０００７】この従来例は、図８に示す従来例において、端子台１０００、１１００を省略し、ＤＣ－ＤＣコンバータモジュール２００は主バッテリ１の両端から絶縁被覆電源ケーブル１２００、１３００により直接給電されている。

【０００８】

【発明が解決しようとする課題】。しかしながら、上述した各従来の電気自動車用動力回路では、主バッテリ１から補機バッテリ３及び走行モータ７へ給電する電流量が極めて大きいという事実のために、次に説明する問題が生じた。図７に示すオールインワンモジュールでは、冷却基板（ヒートシンク）上の絶縁基板に、補機バッテリ３へ給電するＤＣ－ＤＣコンバータ及びＤＣ－ＡＣインバータの両方を実装するので、全体形状特に平面形状が扁平状に大きくなって車両搭載が困難化するという欠点と、ＤＣ－ＤＣコンバータ及びＤＣ－ＡＣインバータの一方が故障した場合でも、このオールインワンモジュール２６０を取り外して修理し、再度取り付けたり、場合によってはオールインワンモジュールごと交換したりせねばならず、修理の手間及び費用が大きくなってしまう欠点とが生じた。

【０００９】そこで、本発明者らは、ヒートシンクを有するアルミ保護ケースの底部にＤＣ－ＡＣインバータを実装し、その蓋板内面にＤＣ－ＤＣコンバータを実装して、２階建構造とすることにより必要面積の削減を考えた。また、この場合には、蓋板の交換によりＤＣ－ＤＣコンバータを交換でき、箱側の交換によりＤＣ－ＡＣインバータを交換できる可能性が考えられる。しかし、このような内部２階建て構造では、箱から蓋を取り外せるようにするために、その入力ライン（電源ライン）や出力ラインなどを冗長に作っておく必要があり、ケース内部にこの冗長な各ラインを収容せねばならず、ケース容積、重量の大幅な増大がかえって生じてしまうことがわかった。

【００１０】次に、図８に示す従来例は、図７に示すオールインワンモジュールに比べて、絶縁被覆電源ケーブル１２００、１３００を余分に必要とし、その分だけ重量、費用及び抵抗損失が大きいという問題、ＤＣ－ＤＣコンバータモジュール２００及びＤＣ－ＡＣインバータモジュール６００の内部発熱も大きいので、それらの冷却系が複雑大型化するという大きな問題があった。また、端子台１０００、１１００を設ける部位に端子箱を別設せねばならず、端子箱設置分の必要スペース、重量及び費用の増加や配線接続の手間の増大が問題となった。

【００１１】次に、図９に示す従来例では、図８に示す従来例に比べて絶縁被覆電源ケーブル１２００、１３００の端末は絶縁被覆電源ケーブル８００、９００の端末と同時に主バッテリ１の両端のターミナルに接続されるので、端子箱が省略できる利点が生じるものの、絶縁被覆電源ケーブル１２００、１３００を主バッテリ１まで延長せねばならず、その重量、配線スペース及び費用の大幅な増大を招く問題が生じた。

【００１２】本発明は上記問題に鑑みなされたものであり、全体重量及びスペースを低減でき、冷却性、信頼性、交換性に優れた電力用回路モジュールを提供することを、その目的としている。本発明は特に電気自動車用のＤＣ－ＡＣインバータ及びＤＣ－ＤＣコンバータとして用いられる電力用回路モジュールに特に好適であるので、本発明は、特に、全体重量及びスペースを低減でき、冷却性、信頼性、交換性に優れた電気自動車用の電力用回路モジュールを提供することを、他の目的としている。

【００１３】

【課題を解決するための手段】請求項１記載の電力用回路モジュールの構成によれば、高圧バッテリからそれぞれ高圧大電流を給電される第１回路部及び第２回路部は別々にモジュール化される。本構成では特に、第１回路部モジュールの冷却基板（ヒートシンク及び伝熱部材）と第２回路部モジュールの冷却基板（ヒートシンク及び伝熱部材）が重ね合わされた状態で一体に結合される。

【００１４】これにより、両冷却基板間の伝熱抵抗が極少となり、一方の発熱が他方のそれより優勢である場合には、他方の冷却基板がその発熱優勢な方の回路部のための追加の冷却基板として機能し、その温度上昇を抑止することができる。また、一方の冷却基板に水冷や強制送風などの特別の強制冷却構造を設ける場合には、これにより他方の冷却基板になんら特別の強制冷却構造を設けなくても、それを自然冷却のみで従来より格段に良好に冷却することもできる。

【００１５】また、互いに異なる負荷へ給電するこれら両モジュールが別体として分離できるので、修理のための着脱や交換がオールインワンモジュールに比較して大幅に簡単となる。更に、本構成の電力用回路モジュールは、互いに密接する両冷却基板それぞれに設けられ互いに連通する連通孔に、貫通型接続導体を冷却基板に対して電気絶縁可能に貫設しているので、上記した従来例に比較して、構成が簡素となり、電源ライン配線長の短縮及びそれによる抵抗損失の低減も実現することができる。

【００１６】この点について更に詳しく説明する。まず、上記貫通型接続導体を用いて両モジュールの内部電源ライン（通常はブスバー）同士を接続すれば、絶縁被覆電源ケーブルは、高圧バッテリは一方のモジュールに絶縁被覆電源ケーブルで給電すればよく、高価な絶縁被覆電源ケーブルを短縮することができる。すなわち、図

７、図８に示す従来構成における、絶縁被覆電源ケーブル１２００、１３００及びＤＣ－ＤＣコンバータモジュール２００の一対の電源端子及び端子台１０００、１１００を省略することができ、重量、スペース、費用の節約を実現することができる。もちろん、本構成では、上記省略の代わりとして、貫通型接続導体を必要とするが、それはたとえばブスバーを延長するだけでも構成できるものであり、両者の接触部位である両冷却基板を貫通するので長さも極めて短く、絶縁被覆電源ケーブルの引き回しとは問題とはならない。

【００１７】更に、本構成における連通孔は、実質的に外部から遮断分離可能であるので、パイプなどを追加する必要もなく、従来の絶縁被覆電源ケーブル引き込みに比較して防水性の向上を容易に実現することができる。請求項２記載の構成によれば請求項１記載の電力用回路モジュールにおいて更に、第１回路部側の冷却基板に固定されて連通孔を貫通する電気絶縁性の貫通型端子台が設けら、貫通型接続導体は、両端が前記ケースの両内部空間に露出した状態で貫通型端子台に囲覆、支持されて、一端が第１回路部の電源ライン（たとえばブスバー）に、他端が第２回路部の電源ライン（たとえばブスバー）に接続される。すなわち、この貫通型接続導体付きの貫通型端子台は、両端側にそれぞれ内部の貫通型接続導体で短絡された必要数の接続端子をそれぞれもつ独特の端子台構造をもつ。このようにすれば、貫通型接続導体の支持、組み付け、分離が容易となる。

【００１８】請求項３記載の構成によれば請求項２記載の電力用回路モジュールにおいて更に、第２回路部側のケース（貫通型端子台が固定されない側のケース）は、連通孔、貫通型端子台及び絶縁基板を囲む外周壁部と、連通孔及び貫通型端子台と絶縁基板とを隔てる隔壁部と、貫通型端子台を密閉する第１の蓋板と、絶縁基板を密閉する第２の蓋板とを備える。

【００１９】このようにすれば、両回路部モジュールを分離するに際し、第２回路部のケースの開口を全面的に開口して第２回路部の内部を露出することなく、ただ、小さい第１の蓋板だけを取り外すだけでよいので、両モジュールを分離できるので、作業安全性及び耐環境性に特に優れるという作用効果を奏する。請求項４記載の構成によれば請求項１乃至３のいずれか記載の電力用回路モジュールにおいて更に、第１回路部側のケースは液冷され、前記第２回路部側のケースは液冷されない。このようにすれば、両モジュールにそれぞれ液冷構造を付設しなくても、両モジュールを良好に冷却することができ、かつ、液冷構造をもたない第２回路部モジュールは着脱が容易で交換性に優れるという効果を奏することができる。

【００２０】請求項５記載の構成によれば請求項１乃至４のいずれか記載の電力用回路モジュールにおいて更に、連通孔と貫通型端子台との間に形成されて両ケースの内部空間を連通する呼吸孔を有する。このようにすれば、一方のケース内の空気温度が他方のケース内の空気温度よりも大きく変化してより顕著に膨張、収縮しても、両ケース内部空間が互いに連通しているので、一方の内部空間で膨張した空気は呼吸孔を通じて比較的冷たいもう一方の内部空間に流れて冷やされることになり、結局、両内部空間の圧力変化はこの呼吸孔の存在により減少することがわかる。

【００２１】なお、絶縁被覆電源ケーブルの連通孔や螺子穴などをもつ場合、ケースの内部空間を高度に気密化することは困難であり、このため、内部圧力が変化すると、それに応じて内部空間と外気との間で空気移動（呼吸）が生じて、外部から内部空間に湿気や水分や腐蝕性ガスなどが侵入してしまう。この問題は上記呼吸孔の維持により抑止される。

【００２２】請求項６記載の構成によれば請求項１乃至５のいずれか記載の電力用回路モジュールにおいて更に、第１回路部は電気自動車用の走行モータ駆動用のＤＣ－ＡＣインバータモジュールからなり、第２回路部は電気自動車用の補機バッテリ充電用のＤＣ－ＤＣコンバータモジュールからなる。電気自動車の主バッテリは、ＤＣ－ＤＣコンバータモジュールを通じて補機バッテリーを充電し、このＤＣ－ＤＣコンバータモジュールとは別体のＤＣ－ＡＣインバータモジュールを通じて走行モータを駆動制御する。

【００２３】これら両モジュールは、同時に発熱することはなく、したがって、一方の作動的に他方が単なるヒートシンク及び放熱体として機能することができ、非常に有利である。請求項７記載の構成によれば請求項１乃至６のいずれか記載の電力用回路モジュールにおいて更に、連通孔は、両冷却基板間に介設されるＯリングによりシールされるので、一層のシール効果を奏することができる。

【００２４】請求項８記載の構成によれば請求項１乃至７のいずれか記載の電力用回路モジュールにおいて更に、両冷却基板は、低圧側の内部電源ラインを兼ねるので、構成を簡素化することができる。請求項９記載の構成によれば請求項４記載の電力用回路モジュールにおいて更に、第１回路部側のケースは、第２回路部側のケースに接する側の部位に位置して冷却液通路を有する。

【００２５】このようにすれば、冷却液通路から第２回路部側のケースまでの伝熱抵抗が小さくなるので、ケースが液体冷されない第２回路部の温度上昇抑止に効果がある。

【００２６】

【発明の実施の形態】本発明の好適な実施態様を以下の実施例を参照して説明する。

【００２７】

【実施例１】本発明の電力変換装置を電気自動車の駆動回路に適用した一実施例を図面を参照して説明する。

（電気自動車の駆動回路説明）この実施例の電気自動車の回路を図１に示すブロック図により説明する。

【００２８】主バッテリ１は、本実施例の電力変換装置をなすＤＣ－ＤＣコンバータ２およびＤＣ－ＡＣインバータモジュール６にそれぞれ給電しており、ＤＣ－ＤＣコンバータ２は補機バッテリ３及び車両用各種補機４に低圧の直流電源電圧を給電している。５はＤＣ－ＤＣコンバータモジュール２に補機バッテリ充電動作を指令する手動スイッチであり、ＤＣ－ＡＣインバータモジュール６は車両走行用の三相交流モータ７に給電している。

【００２９】（ＤＣ－ＤＣコンバータ２）ＤＣ－ＤＣコンバータ２を図２に示す回路図により説明する。５は補機バッテリ３からの電圧をＤＣ－ＤＣコンバータモジュール２に印加する充電指令スイッチである。Ｈブリッジ回路３Ａは、ＮチャンネルＭＯＳＦＥＴからなるハイサイドスイッチ３１、３２と、ＮチャンネルＭＯＳＦＥＴからなるローサイドスイッチ３３、３４と、これらスイッチ３１～３４と個別に逆並列接続されるダイオードＤとからなる。

【００３０】互いに直列に接続されたハイサイドスイッチ３１及びローサイドスイッチ３３は第１の相スイッチ回路を構成し、互いに直列に接続されたハイサイドスイッチ３２及びローサイドスイッチ３４は第２の相スイッチ回路を構成し、これら両相スイッチ回路は主バッテリ１から給電される直流電力を単相交流電力に変換する。ハイサイドスイッチ３１及びローサイドスイッチ３３の接続点である第１の相スイッチ回路の出力端と、ハイサイドスイッチ３２及びローサイドスイッチ３４の接続点である第２の相スイッチ回路の出力端とは、降圧用のトランス２２の一次コイルに接続されており、トランス２２の二次コイルの電圧はダイオード２３、２４により整流された後、リアクトル２５及びコンデンサ２６からなる平滑回路で平滑されて補機バッテリ３を充電している。

【００３１】２７はトランス２２の一次電流を検出する電流センサであり、検出した電流はコントロール回路２８に出力される。コントロール回路２８は、主バッテリ１から給電される定電圧電源２９から一定の電源電圧を給電されて作動し、補機バッテリ３の電圧およびトランス２２の一次電流に基づいてそれらが所定値となるようにドライブ回路３０を通じてＭＯＳＦＥＴ３１～３４を断続制御している。

【００３２】４０、４１は主バッテリ１の両端に接続されるＤＣ－ＤＣコンバータモジュール２の一対の直流入力端子（電源端子）であり、直流入力端子４０、４１は内部のブスバー４２、４３を通じて上述したＨブリッジ回路３Ａに給電する。４４はリップル除去用のコンデンサであり、４５、４６は補機バッテリ３へ低圧の直流電力を出力する端子である。

【００３３】（ＤＣ－ＡＣインバータモジュール６）ＤＣ－ＡＣインバータモジュール６を図３に示す回路図により説明する。６１～６６はＩＧＢＴであって、６１～６３はハイサイドスイッチ、６４～６６はローサイドスイッチである。互いに直列に接続されたハイサイドスイッチ６１及びローサイドスイッチ６４は第１の相スイッチ回路を構成し、互いに直列に接続されたハイサイドスイッチ６２及びローサイドスイッチ６５は第２の相スイッチ回路を構成し、互いに直列に接続されたハイサイドスイッチ６３及びローサイドスイッチ６６は第３の相スイッチ回路を構成し、各相スイッチ回路は主バッテリ１から給電されている。ＤはＩＧＢＴ３６～４１と並列接続されたフライホィルダイオードであり、誘導性負荷である三相交流モータ７に還流電流を供給するためのものである。各相スイッチ回路の出力端は、それぞれ、三相交流モータ７の各端子に個別に接続されている。

【００３４】６７、６８は第１、第２の出力電流を検出する電流センサであり、コントローラ６９はこれら出力電流、及び、アクセルセンサ５０から受信したモータ制御信号に基づいてＩＧＢＴ６１～６６を断続制御して三相交流モータ７を指令された回転数で回転させる。

（ＤＣ－ＤＣコンバータモジュール２およびＤＣ－ＡＣインバータモジュール６の構造）ＤＣ－ＤＣコンバータモジュール２およびＤＣ－ＡＣインバータモジュール６の基本構成を図１を参照して説明する。

【００３５】主バッテリ１の両端は、ＤＣ－ＡＣインバータモジュール６の直流入力端子（電源端子）１６、１７を通じてＤＣ－ＡＣインバータモジュール６の内部に配設されたブスバー８、９の端末からなるその分岐端子７０、７１に個別に接続されている。ブスバー８、９は図１では図示しないＤＣ－ＡＣインバータ回路に給電し、その分岐端子７０、７１は、貫通型端子台の貫通型接続導体１４、１５を通じて、ＤＣ－ＤＣコンバータモジュール２の内部に配設されたブスバー４２、４３の端末からなる直流入力端子（電源端子）１６、１７に接続されている。

【００３６】図４に、両モジュール２、６の縦断面図を示す。ＤＣ－ＤＣコンバータモジュール２は、上端開口のケース２０１をもち、ケース２０１は、底板部２０１ａと、外周壁部２０１ｂと、隔壁部２０１ｃとからなるアルミ成形品からなる。ケース２０１の上端開口は、それぞれアルミ板である第１の蓋板２０２と第２の蓋板２０３の締結により遮蔽されている。

【００３７】隔壁部２０１ｃは、ケース２０１の内部空間を回路室２０４と接続室２０５とに区画しており、第１の蓋板２０２は接続室２０５を密閉し、第２の蓋板２０３は回路室２０４を密閉している。底板部２０１ａは接続室２０５に連通する貫通孔２０６を有する。回路室２０４に面する底板部２０１ａに絶縁基板２０７が接合され、絶縁基板２０７には図２に示すＤＣ－ＤＣコンバータをなす回路素子２０８が実装されている。

【００３８】ＤＣ－ＡＣインバータモジュール６は、上端開口のケース６０１をもち、ケース６０１は、底板部６０１ａと、外周壁部６０１ｂとからなるアルミ成形品からなる。ケース６０１の上端開口は、それぞれアルミ板である蓋板６０２の締結により遮蔽されて、ケース６０１の内部空間ｓを遮蔽している。蓋板６０２はモジュール２の接続室２０５に連通する貫通孔６０６を有する。蓋板６０２に絶縁基板６０７が接合され、絶縁基板６０７には図３に示すＤＣ－ＡＣインバータをなす回路素子６０８が実装されている。

【００３９】６０９は、底板部６０１ａに穿設された両端開口の冷却水通路であり、この冷却水通路６０９の両端はコネクタパイプ６１０によりホース６１１に接続されて、冷却水が循環している。７００は、ケース２０１及び蓋板６０２をケース６０１に締結するボルトであり、７０１は蓋板２０２、２０３をケース２０１に締結するボルトである。

【００４０】８００は蓋板６０２の内面にボルト７０２で締結された電気絶縁樹脂成形品である貫通型端子台であり、貫通型端子台８００には一対の銅板からなる貫通型接続導体１４、１５が垂直に埋設されている。貫通型端子台８００の上下端面から露出する貫通型接続導体１４、１５の上下両端部にはねじ穴が形成されており、これらねじ穴にはブスバー８、９及び４２、４３が締結されている。

【００４１】図５に、接続室２０５近傍の拡大部分斜視図を示す。ただし、第１の蓋板２０２は省略されている。この装置の組み立てを以下に説明する。分解は当然逆の手順で行えばよい。まず、ケース２０１に回路素子２０８及びブスバー４２、４３を実装し、蓋板６０２に貫通型端子台８００、回路素子６０８及びブスバー８、９を実装し、ブスバー８、９を貫通型端子台８００の貫通型接続導体８０１、８０２に締結する。また、第２の蓋板２０３をケース２０１に締結する。

【００４２】次に、ボルト７００で、ケース６０１に蓋板６０２及びケース２０１を締結した後、ブスバー４２、４３を貫通型端子台８００の貫通型接続導体８０１、８０２に締結し、その後、第１の蓋板２０２をケース２０１に締結する。冷却水通路６０９に冷却水を流すと、全てアルミ製であるので、ケース６０１から蓋板６０２、ケース２０１を通じて回路素子２０８は良好に冷却される。９００は呼吸孔である。９０１は連通孔密閉用のＯリングである。

（変形態様１）上記実施例では、貫通型端子台８００は一対の貫通型接続導体８０１、８０２を有しているが、正電位側の貫通型接続導体８０１だけを残して、貫通型接続導体８０２を省略することも可能である。すなわち、負側の貫通型接続導体８０２の代わりに、ケース２０１と蓋板６０２の電気的接触を用いることができる。

（変形態様２）他の変形態様を図６を参照して説明する。ただし、上記実施例と主要機能が共通する構成要素には同一符号を付す。

【００４３】この変形態様では、モジュール６ののケース６０１は、下端開口とされ、下蓋板６０２０で内部空間ｓが閉鎖されている。そして、ケース６０１の上側の底板部６０１ａには上端開口の溝部６０９が形成され、この溝部６０９は、蓋板６０２の締結により遮蔽されて、溝部６０９を冷却水通路としている。このようにすれば、複雑な曲管形状の冷却水通路の形成が容易となる他、冷却水通路６０９によりモジュール２の冷却性が向上する。

【００４４】なお、蓋板６０２を省略して、ケース２０１により溝部６０９を遮蔽して冷却水通路としてもよい。

【図面の簡単な説明】

【図１】この発明の電力用回路モジュールをなす電気自動車用ＤＣ－ＡＣインバータモジュール及びＤＣ－ＤＣコンバータモジュールを示す回路図である。

【図２】図１のＤＣ－ＤＣコンバータモジュール２の回路図である。

【図３】図１のＤＣ－ＡＣインバータモジュールの回路図である。

【図４】図１の電力用回路モジュールの縦断面図である。

【図５】図１の接続室２０５近傍の拡大部分斜視図である。

【図６】図１の電力用回路モジュールの変形態様を示す縦断面図である。

【図７】従来の電力用回路モジュールをなす電気自動車用ＤＣ－ＡＣインバータモジュール及びＤＣ－ＤＣコンバータモジュールを示す回路図である。

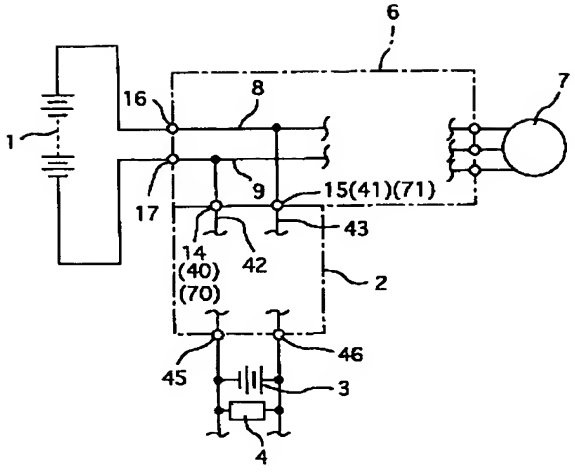
【図８】従来の電力用回路モジュールをなす電気自動車用ＤＣ－ＡＣインバータモジュール及びＤＣ－ＤＣコンバータモジュールを示す回路図である。

【図９】従来の電力用回路モジュールをなす電気自動車用ＤＣ－ＡＣインバータモジュール及びＤＣ－ＤＣコンバータモジュールを示す回路図である。

【符号の説明】

１は主バッテリ（高圧バッテリ）、２はＤＣ－ＤＣコンバータモジュール（第１回路部）、６はＤＣ－ＡＣインバータモジュール（第２回路部）、２０１はケース（冷却基板）、２０２は第２の蓋板、２０３は第２の蓋板、６０１はケース、６０２は蓋板（冷却基板）、２０７、６０７は絶縁基板、８、９、４２、４３はブスバー（内部電源ライン）、２０６、６０６は連通孔、８００は貫通型端子台、８０１、８０２は貫通型接続導体、９００は呼吸孔、９０１はＯリング。

【図１】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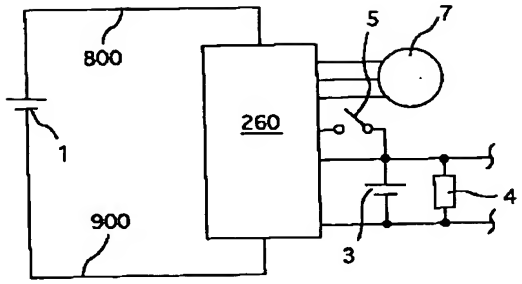
【図７】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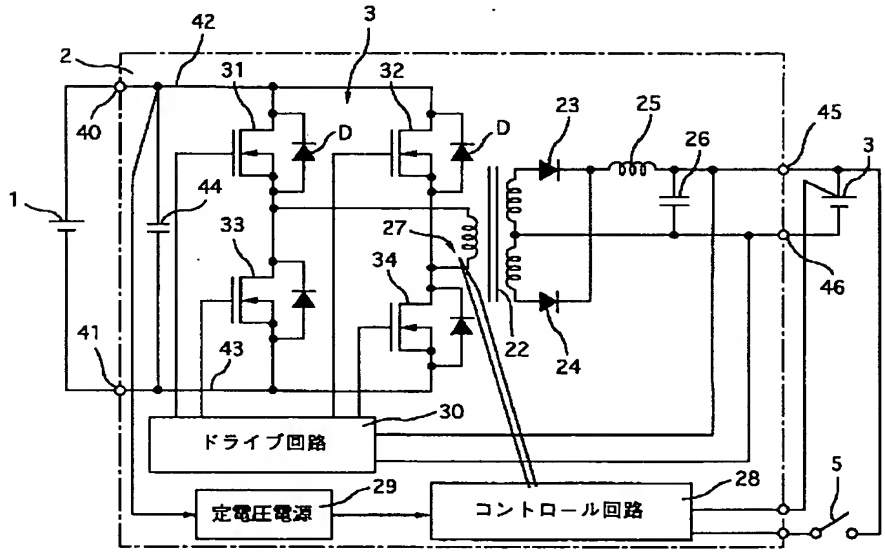
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ドライブ回路
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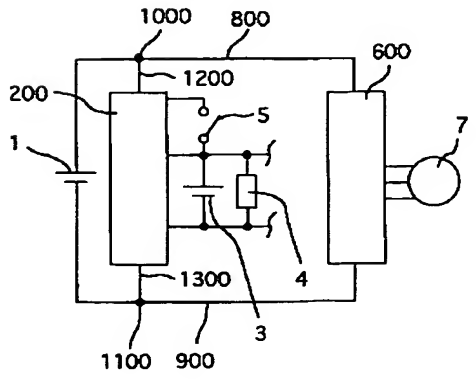
5
定電圧電源
コントロール回路

【図８】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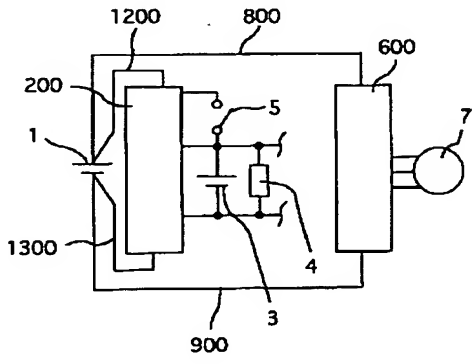
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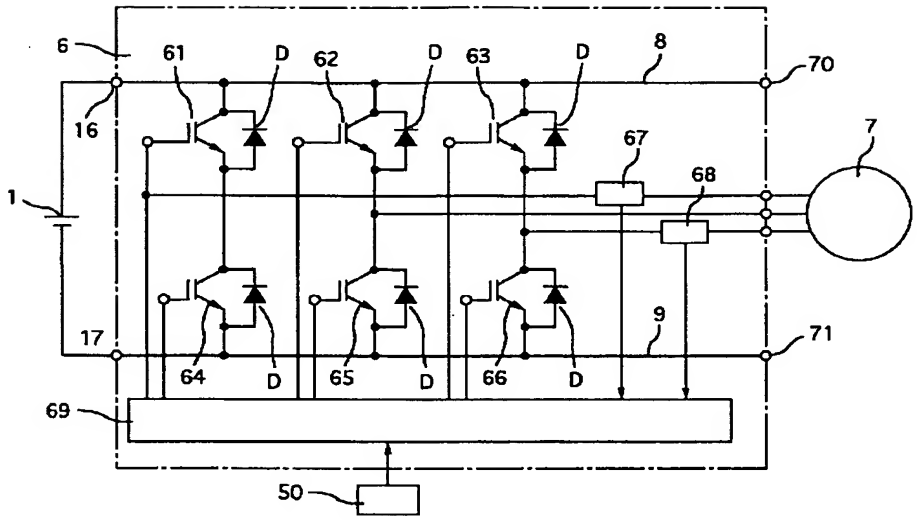
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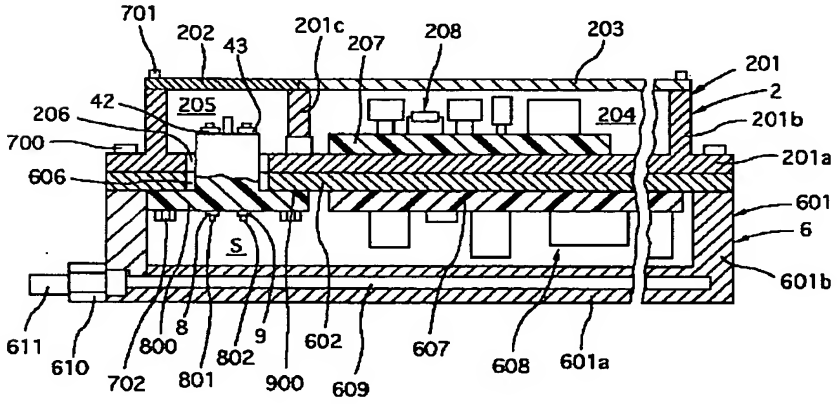
【図４】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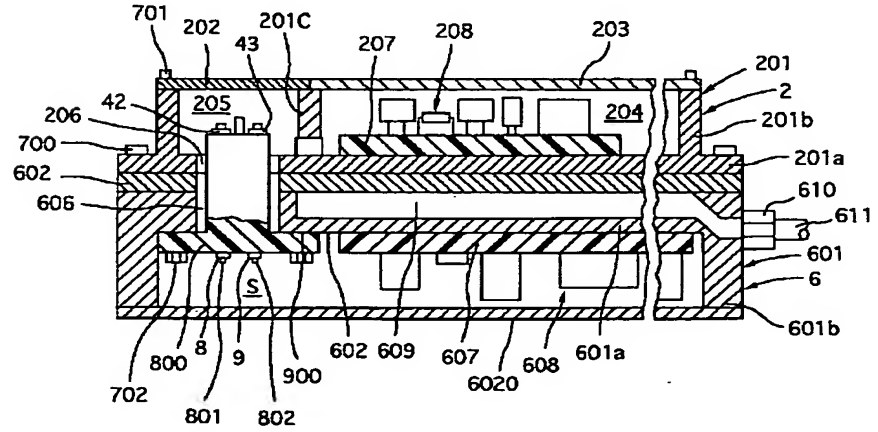
【図６】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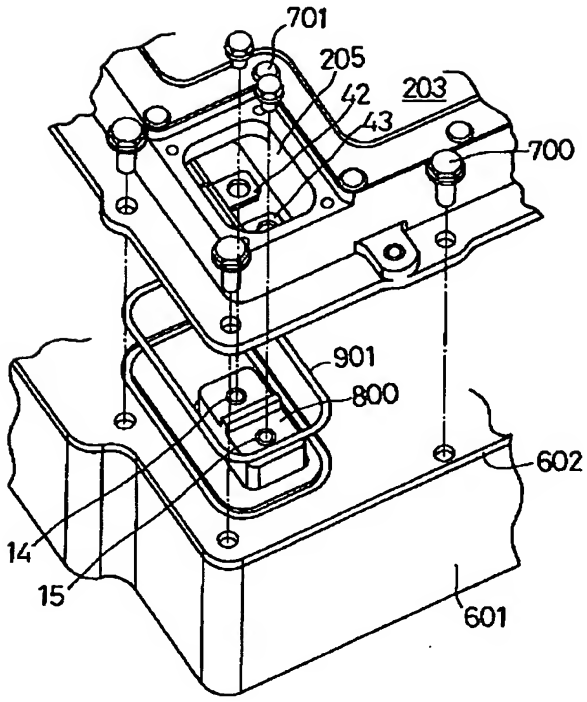
【図５】



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車株式会社内

* NOTICES *

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3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] While carrying out the laminating of the receipt unit and heat dissipation unit by which communication equipment is contained by turns in the vertical direction and arranging them in it So that a convection-current induction plate may be arranged in said heat dissipation unit and said convection-current induction plate may be inclined free [rotation] within said heat dissipation unit In the equipment rack for communication equipment which stops the anterior part of said convection-current induction plate at the pars basilaris ossis occipitalis of said heat dissipation unit, and comes to arrange an optical cable extra length processing implement on the top face of said convection-current induction plate, in the state of the inclination which raised the posterior part of said convection-current induction plate The equipment rack for communication equipment characterized by having the inclination maintenance device in which said convection-current induction plate is held, in the side-face side of said heat dissipation unit.
[Claim 2] In the equipment rack for communication equipment according to claim 1 said inclination maintenance device The rotation member of the shape of a long picture which it is arranged along with a cross direction in a heat dissipation unit, and is rotated in the vertical direction focusing on the supporting-point section, The equipment rack for communication equipment characterized by having the rotation device stopped for the fixed device fixed for the front end section of said rotation member, and the pars basilaris ossis occipitalis of said heat dissipation unit, enabling free attachment and detachment, and the back end section of said rotation member and the posterior part of said convection-current induction plate, enabling free rotation.
[Claim 3] The equipment rack for communication equipment characterized by coming to stop said back end section of said rotation member, and the posterior part of said convection-current induction plate free [sliding] in the equipment rack for communication equipment according to claim 2.
[Claim 4] The equipment rack for communication equipment characterized by coming to stop said supporting-point section of said rotation member, and the supporting-point supporter of said heat dissipation unit free [sliding] in the equipment rack for communication equipment according to claim 1.
[Claim 5] The equipment rack for communication equipment characterized by coming to stop said anterior part of said convection-current induction plate, and said pars basilaris ossis occipitalis of said heat dissipation unit free [sliding] in the equipment rack for communication equipment according to claim 2.
[Claim 6] The equipment rack for communication equipment characterized by coming to connect each front end section of said rotation member mutually by the long picture-like connection member in the equipment rack for communication equipment of claim 2 thru/or claim 5 given in any 1 term while arranging said rotation member on both sides of said heat dissipation unit.
[Claim 7] The equipment rack for communication equipment characterized by coming to form said connection member by the rod part material of a cross-section circular configuration in the equipment rack for communication equipment according to claim 6.

[Claim 8] The equipment rack for communication equipment characterized by arranging said connection member and said convection-current induction plate, and becoming so that predetermined spacing may be formed between said connection member and said convection-current induction plate when said posterior part of said convection-current heat sink is turned to the upper part of said heat dissipation unit and it inclines in the equipment rack for communication equipment according to claim 6 or 7.
[Claim 9] The equipment rack for communication equipment characterized by coming to connect said rod part material with said rotation member free [rotation] in the equipment rack for communication equipment according to claim 7 while forming the bending section of a concave configuration in said rod part material.
[Claim 10] The equipment rack for communication equipment characterized by coming to form in said supporter material the bend which curves to predetermined radius of curvature while arranging the supporter material which supports an optical cable to said anterior part of said convection-current induction plate in the equipment rack for communication equipment of claim 2 thru/or claim 9 given in any 1 term.
[Claim 11] The equipment rack for communication equipment characterized by coming to arrange the covering member corresponding to the configuration of said bend ahead [of said bend of said supporter material] free [attachment and detachment] in the equipment rack for communication equipment according to claim 10.
[Claim 12] The equipment rack for communication equipment characterized by coming to arrange the buffer member which absorbs the impact at the time of rotating said convection-current induction plate to said pars-basilaris-ossis-occipitalis side of said heat dissipation unit between said anterior part of said convection-current induction plate, and said pars basilaris ossis occipitalis of said heat dissipation unit in the equipment rack for communication equipment of claim 2 thru/or claim 11 given in any 1 term.
[Claim 13] In the equipment rack for communication equipment according to claim 1 said inclination maintenance device The holddown member arranged at the both sides of said posterior part of said convection-current induction plate, and the lobe material which is fixed to said holddown member, has spring nature in said direction of a side face of said heat dissipation unit, and projects in it, The equipment rack for communication equipment characterized by having the stop section which is formed in said side face of said heat dissipation unit, and stops the tip of said lobe material.
[Claim 14] The equipment rack for communication equipment characterized by coming to fix the operating member of which said lobe material is drawn in said side face and opposite side of said heat dissipation unit, and a stop with said stop section is canceled to said lobe material in the equipment rack for communication equipment according to claim 13.
[Claim 15] The equipment rack for communication equipment characterized by coming to form the ramp which inclines towards the inside around said crevice while forming the crevice dented caudad towards the location where said optical cable extra length processing implement of said convection-current induction plate is arranged in the equipment rack for communication equipment of claim 1, claim 13, or claim 14 given in any 1 term.
[Claim 16] The optical cable extra length processing implement arranged in the equipment rack for communication equipment according to claim 15 in said crevice of said convection-current induction plate is an equipment rack for communication equipment characterized by having the cable winding section which winds an optical cable, and the tabular cable attaching part which extends towards a perimeter from said cable winding section, and is formed on the plate surface of said convection-current induction plate, and an abbreviation same side.
[Claim 17] The equipment rack for communication equipment characterized by coming to fix the interior material of a proposal inserted in said guide rail free [sliding] at said both sides of said convection-current induction plate while countering and forming the guide rail of the shape of radii centering on said anterior part of said convection-current induction plate in said side face of said heat dissipation unit in the equipment rack for communication equipment of claim 13 thru/or claim 16 given in any 1 term.
[Claim 18] The equipment rack for communication equipment characterized by coming to form the

lower limit of said guide rail in a location higher than said anterior part of said convection-current induction plate in the equipment rack for communication equipment according to claim 17.
[Claim 19] The equipment rack for communication equipment characterized by coming to form in the perimeter of said interior material of a proposal the rotation section which rotates the inside of said guide rail free in the equipment rack for communication equipment according to claim 17 or 18.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the equipment rack for communication equipment especially equipped with the optical cable extra length processing implement in the heat dissipation unit with respect to the equipment rack for communication equipment equipped with the receipt unit by which communication equipment, such as an optical-communication device, is contained, and a heat dissipation unit.
[0002]
[Description of the Prior Art] Conventionally, what is indicated by JP,8-23179,A is known as an equipment rack for communication equipment equipped with the optical cable extra length processing section in the heat dissipation unit. Drawing 35 and drawing 36 show this kind of equipment rack for communication equipment, and in the equipment rack body 1, the receipt unit 5 which contains the communication equipment 3, such as an optical-communication device, and the heat dissipation unit 7 carry out the laminating of them by turns, and they are arranged.
[0003] In the heat dissipation unit 7, the convection-current induction plate 9 which consists of a sheet metal is arranged. On the hinge 11 with a built-in spring, anterior part 9a of this convection-current induction plate 9 is hinged on pars-basilaris-ossis-occipitalis 7a of the heat dissipation unit 7, and rotation of it in the vertical direction is enabled focusing on anterior part 9a. Two or more optical cable extra length processing implements 15 for performing extra length processing of an optical cable 13 are attached in top-face 9b of the convection-current induction plate 9.
[0004] The rod-like rotation lock section 19 is attached in anterior part 7b of the heat dissipation unit 7 through the fixture 17. In the equipment rack for communication equipment mentioned above, as it is shown below, the optical cable 13 introduced from the outside is connected to the communication equipment 3 contained by the receipt unit 5. That is, it is depressed until the convection-current induction plate 9 turns caudad, is pressed and will be in a level condition against the spring force of the hinge 11 with a built-in spring first.
[0005] Next, as shown in drawing 37 , the rod-like rotation lock section 19 rotates and the convection-current induction plate 9 is held by this rotation lock section 19 in the level condition. And the space for performing extra length processing of an optical cable 13 is formed above the convection-current induction plate 9 in the heat dissipation unit 7. Next, an optical cable 13 is introduced in the heat dissipation unit 7 from the backside [the equipment rack body 1].
[0006] As for the introduced optical cable 13, a part for extra length is wound by the optical cable extra length processing implement 15 of the convection-current induction plate 9. And an optical cable 13 is connected to communication equipment 3 via a before [the equipment rack body 1] side. Then, the rotation lock section 19 rotates, the convection-current induction plate 9 is lifted according to a spring operation of the hinge 11 with a built-in spring, and it changes into the inclination condition shown in drawing 35 .
[0007] And the heat generated from the communication equipment 3 located caudad is discharged along

the inclination of the convection-current induction plate 9 at the backside [the equipment rack body 1], and the air for cooling the communication equipment in the upper receipt unit 5 is incorporated from anterior part 7b of the heat dissipation unit 7.
[0008]
[Problem(s) to be Solved by the Invention] However, in such a conventional equipment rack for communication equipment, since the hinge 11 with a built-in spring was always supporting the convection-current induction plate 9, there is a possibility that the spring built in the hinge 11 with a built-in spring may deteriorate by prolonged use, and the spring used for the hinge 11 with a built-in spring needed to be made powerful.
[0009] Consequently, when depressing the convection-current induction plate 9, the strong force was needed and there was a problem that workability fell. Moreover, when the rotation lock section 19 was rotated and the convection-current induction plate 9 was canceled of a level condition, since the convection-current induction plate 9 will be in an inclination condition rapidly according to the strong spring force, the optical cable 13 was pinched strongly between top-face 9b of the convection-current induction plate 9, and the heat dissipation unit 7, and there was a possibility that it might be damaged.
[0010] This invention was made in order to solve this conventional trouble, is a simple device and aims at offering easily the equipment rack for communication equipment which can rotate a convection-current induction plate in a level condition or the inclination condition.
[0011]
[Means for Solving the Problem] While the equipment rack for communication equipment according to claim 1 carries out the laminating of the receipt unit and heat dissipation unit by which communication equipment is contained by turns in the vertical direction and arranges them in it So that a convection-current induction plate may be arranged in said heat dissipation unit and said convection-current induction plate may be inclined free [rotation] within said heat dissipation unit In the equipment rack for communication equipment which stops the anterior part of said convection-current induction plate at the pars basilaris ossis occipitalis of said heat dissipation unit, and comes to arrange an optical cable extra length processing implement on the top face of said convection-current induction plate, in the state of the inclination which raised the posterior part of said convection-current induction plate It is characterized by having the inclination maintenance device in which said convection-current induction plate is held, in the side-face side of said heat dissipation unit.
[0012] The equipment rack for communication equipment according to claim 2 is set to the equipment rack for communication equipment according to claim 1. Said inclination maintenance device The rotation member of the shape of a long picture which it is arranged along with a cross direction in a heat dissipation unit, and is rotated in the vertical direction focusing on the supporting-point section, It is characterized by having the rotation device stopped for the fixed device fixed for the front end section of said rotation member, and the pars basilaris ossis occipitalis of said heat dissipation unit, enabling free attachment and detachment, and the back end section of said rotation member and the posterior part of said convection-current induction plate, enabling free rotation.
[0013] The equipment rack for communication equipment according to claim 3 is characterized by coming to stop said back end section of said rotation member, and the posterior part of said convection-current induction plate free [sliding] in the equipment rack for communication equipment according to claim 2. The equipment rack for communication equipment according to claim 4 is characterized by coming to stop said supporting-point section of said rotation member, and the supporting-point supporter of said heat dissipation unit free [sliding] in the equipment rack for communication equipment according to claim 1.
[0014] The equipment rack for communication equipment according to claim 5 is characterized by coming to stop said anterior part of said convection-current induction plate, and said pars basilaris ossis occipitalis of said heat dissipation unit free [sliding] in the equipment rack for communication equipment according to claim 2. In the equipment rack for communication equipment of claim 2 thru/or claim 5 given in any 1 term, the equipment rack for communication equipment according to claim 6 is characterized by coming to connect each front end section of said rotation member mutually by the long

picture-like connection member while it arranges said rotation member on both sides of said heat dissipation unit.
[0015] The equipment rack for communication equipment according to claim 7 is characterized by coming to form said connection member by the rod part material of a cross-section circular configuration in the equipment rack for communication equipment according to claim 6. In the equipment rack for communication equipment according to claim 6 or 7, when said posterior part of said convection-current heat sink is turned to the upper part of said heat dissipation unit and it inclines, the equipment rack for communication equipment according to claim 8 is characterized by arranging said connection member and said convection-current induction plate, and becoming so that predetermined spacing may be formed between said connection member and said convection-current induction plate.
[0016] In the equipment rack for communication equipment according to claim 7, the equipment rack for communication equipment according to claim 9 is characterized by coming to connect said rod part material with said rotation member free [rotation] while it forms the bending section of a concave configuration in said rod part material. In the equipment rack for communication equipment of claim 2 thru/or claim 9 given in any 1 term, the equipment rack for communication equipment according to claim 10 is characterized by coming to form in said supporter material the bend which curves to predetermined radius of curvature while it arranges the supporter material which supports an optical cable to said anterior part of said convection-current induction plate.
[0017] The equipment rack for communication equipment according to claim 12 is characterized by coming to arrange the buffer member which absorbs the impact at the time of rotating said convection-current induction plate to said pars-basilaris-ossis-occipitalis side of said heat dissipation unit between said anterior part of said convection-current induction plate, and said pars basilaris ossis occipitalis of said heat dissipation unit in the equipment rack for communication equipment of claim 2 thru/or claim 11 given in any 1 term.
[0018] The equipment rack for communication equipment according to claim 13 is set to the equipment rack for communication equipment according to claim 1. Said inclination maintenance device The holddown member arranged at the both sides of said posterior part of said convection-current induction plate, and the lobe material which is fixed to said holddown member, has spring nature in said direction of a side face of said heat dissipation unit, and projects in it, It is formed in said side face of said heat dissipation unit, and is characterized by having the stop section which stops the tip of said lobe material.

[0019] In the equipment rack for communication equipment according to claim 13, the equipment rack for communication equipment according to claim 14 draws said lobe material in said side face and opposite side of said heat dissipation unit at said lobe material, and is characterized by coming to fix the operating member of which a stop with said stop section is canceled. In the equipment rack for communication equipment of claim 1, claim 13, or claim 14 given in any 1 term, the equipment rack for communication equipment according to claim 15 is characterized by coming to form the ramp which inclines towards the inside around said crevice while it forms the crevice dented caudad towards the location where said optical cable extra length processing implement of said convection-current induction plate is arranged.
[0020] The optical cable extra length processing implement with which the equipment rack for communication equipment according to claim 16 is arranged in the equipment rack for communication equipment according to claim 15 in said crevice of said convection-current induction plate is characterized by having the cable winding section which winds an optical cable, and the tabular cable attaching part which extends towards a perimeter from said cable winding section, and is formed on the plate surface of said convection-current induction plate, and an abbreviation same side.
[0021] The equipment rack for communication equipment according to claim 17 is set to the equipment rack for communication equipment of claim 13 thru/or claim 16 given in any 1 term. While countering and forming the guide rail of the shape of radii centering on said anterior part of said convection-current induction plate in said side face of said heat dissipation unit, it is characterized by coming to fix the interior material of a proposal inserted in said guide rail free [sliding] at said both sides of said

convection-current induction plate.
[0022] The equipment rack for communication equipment according to claim 18 is characterized by coming to form the lower limit of said guide rail in a location higher than said anterior part of said convection-current induction plate in the equipment rack for communication equipment according to claim 17. The equipment rack for communication equipment according to claim 19 is characterized by coming to form in the perimeter of said interior material of a proposal the rotation section which rotates the inside of said guide rail free in the equipment rack for communication equipment according to claim 17 or 18.
[0023] (Operation) Since the inclination maintenance device in which a convection-current induction plate is held in the state of an inclination is formed in the side-face side of a heat dissipation unit, it becomes unnecessary to arrange the member for holding a convection-current induction plate at the anterior part or the posterior part of a heat dissipation unit into which an optical cable is introduced in the equipment rack for communication equipment according to claim 1.
[0024] For this reason, it becomes possible to enlarge a part for opening of the anterior part of a heat dissipation unit, or a posterior part, and extra length processing of the optical cable introduced in a heat dissipation unit is performed easily. In the equipment rack for communication equipment according to claim 2, focusing on the supporting-point section of a rotation member, rotation of a rotation member in the vertical direction is enabled, and the back end section of this rotation member is stopped by the posterior part of a convection-current induction plate free [rotation].
[0025] And after extra length processing of an optical cable is carried out within a heat dissipation unit, by depressing the front end section of a rotation member, the back end section of a rotation member rotates towards the upper part, and the posterior part of the convection-current induction plate stopped by coincidence according to a rotation device at the back end section rotates towards the upper part, and it changes a convection-current induction plate into an inclination condition. Then, the front end section of a rotation member and the pars basilaris ossis occipitalis of a heat dissipation unit are fixed by the fixed device, and a convection-current induction plate is held according to it at an inclination condition.
[0026] Furthermore, from the condition that the convection-current induction plate is held at the inclination condition, when performing extra length processing of an optical cable, by canceling a fixed device, a convection-current induction plate rotates by its weight, and it changes it into a level condition.

[0027] And after extra length processing of an optical cable is performed in this condition, a convection-current induction plate is again held by the procedure mentioned above at an inclination condition. In the equipment rack for communication equipment according to claim 3, it rotates mutually, without sliding on the back end section of a rotation member, and the posterior part of a convection-current induction plate, and applying the force with a rotation member and a convection-current induction plate impossible for with rotation of a rotation member.
[0028] In the equipment rack for communication equipment according to claim 4, it rotates mutually, without sliding on the supporting-point section of a rotation member, and the supporter material of a heat dissipation unit, and applying the force with a rotation member and a convection-current induction plate impossible for with rotation of a rotation member. In the equipment rack for communication equipment according to claim 5, it rotates mutually, without sliding on the anterior part of a convection-current induction plate, and the pars basilaris ossis occipitalis of a heat dissipation unit, and applying the force with a rotation member and a convection-current induction plate impossible for with rotation of a rotation member.
[0029] In the equipment rack for communication equipment according to claim 6, a rotation member is arranged at the both sides of a heat dissipation unit, and each front end section of a rotation member is connected by the long picture-like connection member. And by operating a connection member up and down, a rotation member rotates easily and it changes a convection-current induction plate into an inclination condition from a level condition. Moreover, since a convection-current induction plate is supported by the rotation member from both sides, without a convection-current induction plate inclining to right and left, it is stabilized and it changes into a level condition or an inclination condition.

[0030] In the equipment rack for communication equipment according to claim 7, a connection member is formed of rod part material, and front opening of a heat dissipation unit is formed widely. In the equipment rack for communication equipment according to claim 8, when changing the convection-current heat sink into the inclination condition, predetermined spacing being formed between a connection member and the top face of a convection-current induction plate, and an optical cable being inserted between a connection member and a convection-current induction plate, and being damaged is prevented.
[0031] In the equipment rack for communication equipment according to claim 9, the bending section of a concave configuration is formed in the rod part material connected to a rotation member free [rotation], since there is nothing and the bending section of rod part material is always contacted by the convection-current heat sink with a self-weight with respect to the level condition of a convection-current heat sink, and an inclination condition, it is lost that an optical cable is inserted between rod part material and a convection-current induction plate, and damage on an optical cable is prevented certainly.

[0032] In the equipment rack for communication equipment according to claim 10, the supporter material which formed the bend of predetermined radius of curvature in the anterior part of a convection-current induction plate is arranged, and the optical cable drawn from a heat dissipation unit by the bend towards a receipt unit is held at predetermined radius of curvature. In the equipment rack for communication equipment according to claim 11, the covering member corresponding to the configuration of a bend is arranged free [attachment and detachment] ahead [of the bend of supporter material], and the optical cable drawn from a heat dissipation unit by this covering member and bend towards a receipt unit is held more certainly at predetermined radius of curvature.
[0033] In the equipment rack for communication equipment according to claim 12, in case a buffer member is arranged between the anterior part of a convection-current induction plate, and the pars basilaris ossis occipitalis of a heat dissipation unit and a convection-current induction plate rotates to the pars-basilaris-ossis-occipitalis side of a heat dissipation unit, rapid rotation of a convection-current induction plate is prevented, it is added in the force rapid to the optical cable by which extra length processing is carried out on the convection-current induction plate, and being damaged in an optical cable is prevented. In the equipment rack for communication equipment according to claim 13, first, along with the pars-basilaris-ossis-occipitalis side of a heat dissipation unit, it rotates until a convection-current induction plate will be in a level condition, and the optical cable extra length processing implement on a convection-current induction plate is used, and extra length processing of the optical cable introduced in a heat dissipation unit is performed.
[0034] In this case, the lobe material of the both sides of a convection-current induction plate is contacted by the side face of a heat dissipation unit in the state of press in the tip. If the posterior part of a convection-current induction plate is raised after extra length processing of an optical cable is performed, the tip of lobe material will be in the condition which contacted the side face of a heat dissipation unit, and will slide on a side face. Furthermore, if the posterior part of a convection-current induction plate is raised and lobe material moves to the stop section of a heat dissipation unit, lobe material will move towards the stop section according to the spring operation which is suitable in the direction of a side face, and the tip of lobe material will be automatically stopped by the stop section.
[0035] And a convection-current induction plate is stopped on the side face of a heat dissipation unit, and is held in the state of an inclination. In the equipment rack for communication equipment according to claim 14, by drawing an operating member in the side face and the opposite side of a heat dissipation unit, easily, a stop with lobe material and a stop hole is canceled, and the convection-current induction plate in an inclination condition rotates to a level condition with a self-weight.
[0036] In the equipment rack for communication equipment according to claim 15, since the crevice which has a ramp is formed in a perimeter and an optical cable extra length processing implement is arranged in this crevice, in case an optical cable is wound around an optical cable extra length processing implement, an optical cable is enabled to enter in a crevice in a self-weight along with the

ramp of a crevice, and extra length processing of an optical cable is easily performed to a convection-current induction plate in a narrow heat dissipation unit.
[0037] The cable winding section around which the optical cable extra length processing implement arranged in the crevice of a convection-current induction plate winds an optical cable in the equipment rack for communication equipment according to claim 16, It extends towards a perimeter from this cable winding section, and since it has the tabular cable attaching part formed on the plate surface of a convection-current induction plate, and an abbreviation same side, it is prevented that the optical cable wound around the cable winding section separates from an optical cable extra length processing implement by the cable attaching part.
[0038] In the equipment rack for communication equipment according to claim 17, a radii-like slot is formed in the side face of a heat dissipation unit, and it always rotates equally, without a heat dissipation induction plate inclining in the direction of both sides, in case a heat dissipation induction plate rotates in a level condition or the inclination condition since the interior material of a proposal inserted in for this slot, enabling free sliding is fixed to the flank of a convection-current induction plate. For this reason, in case a heat dissipation induction plate is rotated, it is prevented that a heat dissipation induction plate is caught in the side face of a heat dissipation unit.
[0039] Since the lower limit of a guide rail is formed in a location higher than the anterior part of a convection-current induction plate in the equipment rack for communication equipment according to claim 18, In case a convection-current induction plate is leveled and extra length processing of an optical cable is performed along with the pars-basilaris-ossis-occipitalis side of a heat dissipation unit, a convection-current induction plate is enabled to miss outside the heat generated from the equipment which is held slightly at an inclination condition and contained by the downward receipt unit along the inclination of a convection-current induction plate.
[0040] For this reason, it enables it to prevent that a downward receipt unit is filled with heat, and to perform extra length processing of an optical cable for a long time compared with the former. In the equipment rack for communication equipment according to claim 19, since the rotation section which rotates the inside of a guide rail free is formed in the perimeter of the interior material of a proposal, in case it is moved into a guide rail and the interior material of a proposal changes a convection-current induction plate more smoothly into a level condition or an inclination condition, a heat dissipation induction plate rotates smoothly.
[0041]
[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained to a detail using a drawing. Drawing 1 thru/or drawing 3 show the 1st operation gestalt (it corresponds to claim 1, claim 2, claim 5, or claim 7) of the equipment rack for communication equipment of this invention. In drawing, in the vertical direction, to the equipment rack body 21, the receipt unit 25 which contains the communication equipment 23, such as an optical-communication device, and the heat dissipation unit 27 carry out a laminating by turns, and are arranged at it.
[0042] In the heat dissipation unit 27, the convection-current induction plate 29 which carried out folding of the sheet metal is arranged in the level condition. Anterior part 29a of this convection-current induction plate 29 is hinged on pars-basilaris-ossis-occipitalis 27a of the heat dissipation unit 27 on a hinge 31, and rotation of the convection-current induction plate 29 in the vertical direction R1 is enabled focusing on anterior part 29a.
[0043] Two or more optical cable extra length processing implements 35 for performing extra length processing of an optical cable 33 are attached in top-face 29b of the convection-current induction plate 29. Predetermined spacing is kept in posterior part 29c of the convection-current induction plate 29, and two or more formation of the 29d of the notches for introducing an optical cable 33 is carried out at it. The optical cable extra length processing implement 35 is arranged in the location which adjoined 29d of this notch.
[0044] This heat dissipation unit 27 is reinforced and the back up plate 36 by which posterior part 29c of the convection-current induction plate 29 is contacted is attached in up 27b of the heat dissipation unit 27. The rotation members 37 and 37 of the shape of a long picture which carried out folding of the sheet

metal are arranged at the both sides in the heat dissipation unit 27 along with side-attachment-wall 27c of the heat dissipation unit 27. Stop hole 37a is formed, this stop hole 37a is fixed to the support shaft 39 currently fixed to side-attachment-wall 27c of the heat dissipation unit 27 in the center of abbreviation of this rotation member 37, and the rotation member 37 is being fixed to it free [rotation] in the vertical direction R2.

[0045] As shown in drawing 4 , the movable roller 41 which consists of resin is attached in back end section 37b of the rotation member 37. This movable roller 41 is stopped by the bending stop plate 43 of the shape of a cross-section KO typeface formed in the convection-current induction plate 29 free [sliding], and is stopped free [rotation of back end section 37b of the rotation member 37 and the convection-current induction plate 29].

[0046] The **** 45 with a neck equipped with the omission prevention structure for fixing this front end section 37c to pars-basilaris-ossis-occipitalis 27a of the heat dissipation unit 27 is attached in front end section 37c of the rotation member 37. The connecting rod 47 of a cross-section circular configuration which connects front end section 37c, such as this, mutually is being fixed to each front end section 37c of the rotation members 37 and 37.

[0047] Drawing 5 shows the rotation member 37 within the heat dissipation unit 27, and rotation actuation of the convection-current induction plate 29. Focusing on the attachment-by-hinges part on a hinge 31, posterior part 29c draws the circle locus C1, and the convection-current induction plate 29 rotates. Focusing on stop hole 37a, back end section 37b and front end section 37c draw the circle locus C2, and rotate the rotation member 37.

[0048] With this operation gestalt, in order to absorb the difference of the locus of a mutually different circle locus C1 and the circle locus C2, the movable roller 41 of the rotation member 37 is slid within the bending stop plate 43 of the convection-current induction plate 29, and the rotation member 37 and the convection-current induction plate 29 are made to carry out rotation actuation smoothly. And when not operating the rotation member 37, a self-weight changes the convection-current induction plate 29 into a level condition, and it changes the convection-current induction plate 29 into an inclination condition by turning front end section 37c of the rotation member 37 to the bottom, and depressing it.

[0049] The **** 45 with a neck of the rotation member 37 is fixed to pars-basilaris-ossis-occipitalis 27a of the heat dissipation unit 27, and drawing 6 thru/or drawing 8 show the condition that the convection-current induction plate 29 is located in an inclination condition. In this condition, as shown in drawing 8 , spacing S is formed between the connecting rod 47 and the convection-current induction plate 29 so that an optical cable 33 may not be pinched. In the equipment rack for communication equipment mentioned above, as it is shown below, the optical cable 33 introduced from the outside is connected to the communication equipment 23 contained by the receipt unit 25.

[0050] That is, first, as shown in drawing 1 , when the convection-current induction plate 29 is in a level condition, an optical cable 33 is introduced in the heat dissipation unit 27 from the backside [the equipment rack body 21]. The introduced optical cable 33 is introduced into 29d of notches of the convection-current induction plate 29, and is stopped by the optical cable extra length processing implement 35 which adjoins 29d of this notch. And extra length processing of an optical cable 33 is performed by the optical cable extra length processing implement 35 on the convection-current induction plate 29, and the tip side of an optical cable 33 passes along between a connecting rod 47 and the convection-current induction plates 29, and is drawn ahead of the heat dissipation unit 27.

[0051] Furthermore, the drawn optical cable 33 is connected to the communication equipment 23 with which it is contained in the receipt unit 25 of the upper part of the heat dissipation unit 27, or a lower part. Next, a connecting rod 47 is depressed towards pars-basilaris-ossis-occipitalis 27a of the heat dissipation unit 27, this is interlocked with, and the rotation member 37 rotates focusing on stop hole 37a. With rotation of the rotation member 37, the convection-current induction plate 29 rotates, and as shown in drawing 6 , it changes the convection-current induction plate 29 into an inclination condition.

[0052] Under the present circumstances, since the predetermined spacing S is formed between a connecting rod 47 and the convection-current induction plate 29 as shown in drawing 8 , an optical cable 33 is put with a connecting rod 47 and the convection-current induction plate 29, and being damaged is

prevented. Moreover, the optical cable 33 on the backside [the equipment rack body 21] is located in 29d of notches of the convection-current induction plate 29, an optical cable 33 is put by the convection-current induction plate 29 and the back up plate 36, and being damaged is prevented.
[0053] Then, the **** 45 with a neck of the rotation member 37 is fixed to pars-basilaris-ossis-occipitalis 27a of the heat dissipation unit 27, and the convection-current induction plate 29 is held in the state of an inclination. And the heat generated from the communication equipment 23 located under the heat dissipation unit 27 is discharged along the inclination of the convection-current induction plate 29 at the backside [the equipment rack body 21], and the air for cooling the communication equipment 23 located up is incorporated from the front of the heat dissipation unit 27.
[0054] Furthermore, when an optical cable 33 is introduced in the heat dissipation unit 27, immobilization with the **** 45 with a neck of the rotation member 37 and pars-basilaris-ossis-occipitalis 27a of the heat dissipation unit 27 is canceled first. With one's weight, the convection-current induction plate 29 rotates centering on a hinge 31, and this discharge changes it into a level condition.
[0055] It slides on the movable roller 41 at coincidence, and the rotation member 37 rotates focusing on stop hole 37a, and it changes it into the condition which showed in drawing 1 . And the space for performing extra length processing of an optical cable 33 is formed above the convection-current induction plate 29 in the heat dissipation unit 27. In the equipment rack for communication equipment constituted as mentioned above Since the rotation member 37 is arranged free [rotation] in the vertical direction focusing on stop hole 37a of the rotation member 37 and back end section 37b of this rotation member 37 was stopped free [rotation] to posterior part 29c of the convection-current induction plate 29 By rotation actuation of the rotation member 37, the convection-current induction plate 29 can be easily changed into an inclination condition or a level condition by the simple device.
[0056] Moreover, since it considered as the structure which attaches the **** 45 with a neck in front end section 37c of the rotation member 37, and can be fixed to it for front end section 37c and pars-basilaris-ossis-occipitalis 27a of the heat dissipation unit 27, enabling free attachment and detachment, the inclination condition of the convection-current induction plate 29 can be held easily. And since back end section 37b of the rotation member 37 and posterior part 29c of the convection-current induction plate 29 were stopped free [sliding] with the movable roller 41 and the bending stop plate 43, the rotation member 37 and the convection-current induction plate 29 can be rotated easily, without applying the impossible force.
[0057] Furthermore, since the rotation member 37 is arranged on both sides of the heat dissipation unit 27 and each front end section 37c of this rotation member 37 was connected with the long picture-like connecting rod 47, the rotation member 37 can be easily rotated by operating a connecting rod 47 up and down. Moreover, by the rotation member 37, without leaning the convection-current induction plate 29 to right and left, since the convection-current induction plate 29 was supported from both sides, it is stabilized and can change into a level condition or an inclination condition.
[0058] And since front end section 37c of the rotation member 37 was mutually connected with the connecting rod 47 of a cross-section circular configuration, front opening of the heat dissipation unit 27 can be formed widely, and extra length processing of an optical cable 33 can be performed easily. Furthermore, since predetermined spacing was formed between the connecting rod 47 and the convection-current induction plate 29 while changing the convection-current heat sink 29 into the inclination condition, an optical cable 33 can prevent it being inserted between a connecting rod 47 and the convection-current induction plate 29, and being damaged.
[0059] And since the back up plate 36 by which posterior part 29c of the convection-current induction plate 29 is contacted was attached in up 27b of the heat dissipation unit 27, in case the convection-current induction plate 29 is changed into an inclination condition, posterior part 29c of the convection-current induction plate 29 can prevent colliding with the upper receipt unit 25 certainly. Moreover, since 29d of notches for introducing an optical cable 33 into posterior part 29c of the convection-current induction plate 29 was formed, an optical cable 33 is put between the convection-current induction plate 29 and the back up plate 36, and can prevent being damaged certainly.
[0060] Drawing 9 shows the 2nd operation gestalt (it corresponds to claim 3) of the equipment rack for

communication equipment of this invention. With this operation gestalt, stop hole 37a of the rotation member 37 is formed in an ellipse configuration, and this stop hole 37a is being fixed free [rotation] and free [sliding] to the support shaft 39.
[0061] Moreover, back end section 37b of the rotation member 37 and the convection-current induction plate 29 are hinged on the hinge 51. Also in the equipment rack for communication equipment of this operation gestalt, the same effectiveness as the 1st operation gestalt can be acquired. Drawing 10 shows the 3rd operation gestalt (it corresponds to claim 4) of the equipment rack for communication equipment of this invention.
[0062] With this operation gestalt, anterior part 29a of the convection-current induction plate 29 is arranged free [sliding], without being fixed to pars-basilaris-ossis-occipitalis 27a of the heat dissipation unit 27. Moreover, back end section 37b of the rotation member 37 and posterior part 29c of the convection-current induction plate 29 are hinged on the hinge 51. Also in the equipment rack for communication equipment of this operation gestalt, the same effectiveness as the 1st operation gestalt can be acquired.
[0063] Drawing 11 thru/or drawing 13 show the 4th operation gestalt (it corresponds to claim 8) of the equipment rack for communication equipment of this invention. With this operation gestalt, bending section 47a of a concave configuration is formed in a connecting rod 47, and the both ends and the rotation member 37 of a connecting rod 47 are connected to it free [rotation]. And as shown in drawing 11 , when changing the convection-current induction plate 29 into the level condition, with the self-weight of a connecting rod 47, bending section 47a of a connecting rod 47 turns caudad, and hangs, and after the connecting rod 47 has inclined towards posterior part 29c of the convection-current induction plate 29, it is in contact with bending section 47a and the convection-current induction plate 29.
[0064] Moreover, as shown in drawing 12 , when changing the convection-current induction plate 29 into the level condition, after bending section 47a of a connecting rod 47 has projected towards the posterior part 29c side of the convection-current induction plate 29, it is in contact with bending section 47a and the convection-current induction plate 29. At the equipment rack for communication equipment of this operation gestalt, as shown in drawing 1313 , when the convection-current induction plate 29 rotates in the inclination condition from the level condition from an inclination condition, or a level condition, a connecting rod 47 rotates bending section 47a smoothly, where the convection-current induction plate 29 is contacted.
[0065] And irrespective of the level condition or inclination condition of the convection-current induction plate 29, it always changes a connecting rod 47 into the condition of having touched the convection-current induction plate 29, and the optical cable 33 is always located above the connecting rod 47. Also in the equipment rack for communication equipment of this operation gestalt, although the same effectiveness as the 1st operation gestalt can be acquired Since bending section 47a of a concave configuration was formed in the connecting rod 47 and this connecting rod 47 was connected to the rotation member 37 free [rotation] with this operation gestalt With respect to the level condition of the convection-current heat sink 29, and an inclination condition, there is nothing and it can prevent certainly always being able to contact bending section 47a of a connecting rod 47 to the convection-current heat sink 29 with a self-weight, and an optical cable 33 being inserted between a connecting rod 47 and the convection-current induction plate 29, and being damaged.
[0066] Drawing 14 shows the 5th operation gestalt (it corresponds to claim 9) of the equipment rack for communication equipment of this invention, and the optical rod guide 53 which consists of a resin plate is attached in anterior part 29a of the convection-current induction plate 29. It turns to this optical rod guide 53 caudad, and bend 53a whose radius of curvature R is 30mm is formed in it.
[0067] With this operation gestalt, along the curved surface of bend 53a of the optical rod guide 53, an optical cable 33 is drawn from the heat dissipation unit 27, and is connected to the communication equipment 23 side contained by the downward receipt unit 25. Also in the equipment rack for communication equipment of this operation gestalt, although the same effectiveness as the 1st operation gestalt can be acquired Since the optical rod guide 53 which formed bend 53a of the predetermined radius of curvature R in anterior part 29a of the convection-current induction plate 29 was attached with

this operation gestalt The optical cable 33 drawn from the heat dissipation unit 27 towards the receipt unit 25 by this bend 53a can be held to the predetermined radius of curvature R.
[0068] Drawing 15 shows the 6th operation gestalt (it corresponds to claim 10) of the equipment rack for communication equipment of this invention, and the optical rod guide 53 of the same configuration as the 4th operation gestalt mentioned above is attached in anterior part 29a of the convection-current induction plate 29. Moreover, it is fixed that the front plate 55 which consists of a sheet metal can be detached and attached ahead of the heat dissipation unit 27.
[0069] It consists of resin and the guide covering 57 equipped with the configuration corresponding to the curved surface of the optical rod guide 53 is attached in the heat dissipation unit 27 side of this front plate 55. With this operation gestalt, after an optical cable 33 is drawn along the curved surface of the optical rod guide 53, the front plate 55 is fixed to the heat dissipation unit 27.
[0070] And between the optical rod guide 53 and the guide covering 57, an optical cable 33 is pinched gently and held at the predetermined radius of curvature R. Also in the equipment rack for communication equipment of this operation gestalt, although the same effectiveness as the 5th operation gestalt can be acquired With this operation gestalt, ahead [of bend 53a of the optical rod guide 53], since the guide covering 57 corresponding to the configuration of bend 53a has been arranged free [attachment and detachment] The optical cable 33 drawn from the heat dissipation unit 27 towards the receipt unit 25 by this guide covering 57 and bend 53a can be more certainly held to the predetermined radius of curvature R.
[0071] Drawing 16 shows the 7th operation gestalt (it corresponds to claim 11) of the equipment rack for communication equipment of this invention, and coiled spring 59 is attached between anterior part 29a of the convection-current induction plate 29, and pars-basilaris-ossis-occipitalis 27a of the heat dissipation unit 27. The spring force of this coiled spring 59 is made into extent with which the rapid rotation by the self-weight of a convection-current induction plate is prevented when changing a convection-current induction plate into a level condition from an inclination condition.
[0072] Although the same effectiveness as the operation gestalt mentioned above can be acquired also in the equipment rack for communication equipment of this operation gestalt With this operation gestalt, since coiled spring 59 has been arranged between anterior part 29a of the convection-current induction plate 29, and pars-basilaris-ossis-occipitalis 27a of the heat dissipation unit 27 In case the convection-current induction plate 27 is rotated to the pars-basilaris-ossis-occipitalis 27a side of the heat dissipation unit 27, rapid rotation of the convection-current induction plate 29 can be prevented, and the rapid force can join the optical cable 33 by which extra length processing is carried out on the convection-current induction plate 29, and it can prevent that an optical cable 33 is damaged.
[0073] In addition, although the 1st operation gestalt mentioned above described the example which attached the movable roller 41 in back end section 37b of the rotation member 37, and stopped back end section 37b of the rotation member 37, and posterior part 29c of the convection-current induction plate 29 free [rotation] and free [sliding] This invention is not limited to this operation gestalt, and as shown in drawing 17 , drawing 18 , or drawing 19 , it may stop free [rotation of the rotation member 37 and the convection-current induction plate 29] and free [sliding].
[0074] That is, in drawing 17 , 37d of ellipse holes is formed in back end section 37b of the rotation member 37, and the stop shaft 61 fixed by the convection-current induction plate 29 in 37d of this ellipse hole is stopped. Moreover, in drawing 18 , bending edge 37e bent up is formed in back end section 37b of the rotation member 37, and the stop plate 63 of a wrap configuration is being fixed to it by the convection-current induction plate 29 in the perimeter of back end section 37b of the rotation member 37.
[0075] And in drawing 19 , 37f of bending edges bent to the slanting upper part is formed in back end section 37b of the rotation member 37, and stop hole 29e which inserts back end section 37b of the rotation member 37 in the convection-current induction plate 29 is formed. Furthermore, although the 1st operation gestalt mentioned above described the example which performed immobilization with front end section 37c of the rotation member 37, and pars-basilaris-ossis-occipitalis 27a of the heat dissipation unit 27 using the **** 45 with a neck attached in the rotation member 37 This invention is

not limited to this operation gestalt, and as shown in drawing 20 , drawing 21 , drawing 22 , or drawing 2323 , it may fix front end section 37c of the rotation member 37 to anterior part 29a of the convection-current induction plate 29.
[0076] That is, in drawing 20 , 37g of stop holes of a rectangle configuration is formed in front end section 37c of the rotation member 37, and the stop implement 65 which corresponds to the configuration of 37g of stop holes, and is rotated free [rotation] to the convection-current induction plate 29 is attached. And the rotation member 37 and the convection-current induction plate 29 are stopped or canceled by rotating the stop implement 65.
[0077] Moreover, in drawing 21 , it is formed in cross-section the configuration of L characters, and the stop plate 67 which can rotate freely in the vertical direction stopped at anterior part 29a of the convection-current induction plate 29 is attached in front end section 37c of the rotation member 37. And in drawing 22 , the stop plate 69 of a cross-section the configuration of L characters is formed in front end section 37c of the rotation member 37, and 29f of notches of the configuration corresponding to the stop plate 69 is formed in anterior part 29a of the convection-current induction plate 29.
[0078] Synthetic rubber 71 is stuck on 29f of this notch, and the stop plate 69 is stopped in the state of a pressure welding by this synthetic rubber 71 by 29f of notches. Furthermore, in drawing 23 , generally stop projection 73a of the stop member 73 called a ball catch is attached in front end section 37c of the rotation member 37, and stop receptacle 73b of the stop member 73 is attached in anterior part 29a of the convection-current induction plate 29.
[0079] Moreover, although the 5th operation gestalt mentioned above described the example which attached the optical rod guide 53 which curves caudad towards anterior part 29a of the convection-current induction plate 29, and connected the optical cable 33 to the downward communication equipment 23 As it is not limited to this operation gestalt and shown in drawing 2424 , this invention may attach the optical rod guide 53 which curves towards the upper part to the convection-current induction plate 29, and may connect an optical cable 33 to the upper communication equipment 23.
[0080] Furthermore, although the 5th operation gestalt mentioned above described the example which set the radius of curvature R of the optical rod guide 53 to 30mm, and curved, this invention is not limited to this operation gestalt, and should just be curving to the radius of curvature R from which the transmission loss of an optical cable 33 becomes below a predetermined value. Moreover, although the 6th operation gestalt mentioned above described the example which formed in the front plate 55 the guide covering 57 corresponding to the configuration of the optical rod guide 53 which curves towards a lower part, this invention is not limited to this operation gestalt, and may form in the front plate 55 the guide covering 57 corresponding to the configuration of the optical rod guide 53 which curves towards the upper part shown in drawing 23 .
[0081] And although the 7th operation gestalt mentioned above described the example which has arranged coiled spring 59 between anterior part 29a of the convection-current induction plate 29, and pars-basilaris-ossis-occipitalis 27a of the heat dissipation unit 27, this invention is not limited to this operation gestalt, and may arrange shock absorbing material, such as foamed rubber or sponge, for example, the rapid rotation by the self-weight of the convection-current induction plate 29 just prevents it.
[0082] Drawing 25 and drawing 26 show the 8th operation gestalt (it corresponds to claim 1, claim 13, or claim 16) of the equipment rack for communication equipment of this invention. In drawing, in the vertical direction, to the equipment rack body 81, the receipt unit 25 which contains the communication equipment 23, such as an optical-communication device, and the heat dissipation unit 83 carry out a laminating by turns, and are arranged at it.
[0083] In the heat dissipation unit 83, the convection-current induction plate 85 which carried out folding of the sheet metal and formed it is arranged in the state of the inclination. Anterior part 85a of this convection-current induction plate 85 is hinged on pars-basilaris-ossis-occipitalis 83a of the heat dissipation unit 83 on a hinge 31, and rotation of the convection-current induction plate 85 in the vertical direction is enabled focusing on anterior part 85a.
[0084] This heat dissipation unit 83 is reinforced and the back up plate 84 by which posterior part 85b of

the convection-current induction plate 85 is contacted is attached in up 83b of the heat dissipation unit 83. Two or more slit 85c which extends towards anterior part 85a from posterior part 85b is formed in posterior part 85b of the convection-current induction plate 85. Among posterior part 85b of the convection-current induction plate 85, the part between slit 85c is bent towards pars-basilaris-ossis-occipitalis 83a of the heat dissipation unit 83, and 85d of cable induction is formed.

[0085] Two or more optical cable holders 87 for holding the optical cable 33 introduced from the back of the equipment rack body 81 are attached in 85d of cable induction. Moreover, crevice 85e which projects in the pars-basilaris-ossis-occipitalis 83a side of the heat dissipation unit 83 is formed in the center of abbreviation of the convection-current induction plate 85. 85f of ramps which incline towards the inside is formed around crevice 85e.

[0086] Two or more optical cable extra length processing implements 89 for performing extra length processing of an optical cable 33 are attached in 85g of bases of crevice 85e. The optical cable extra length processing implement 89 bends a cross-joint-like plate, and is formed, and it has cable attaching part 89b which extends towards the perimeter of crevice 85e from the upper limit of cable winding section 89a which winds an optical cable 33, and this cable winding section 89a.

[0087] The height of the optical cable extra length processing implement 89 is made into the depth and abbreviation identitas of crevice 85e, and cable attaching part 89b of the optical cable extra length processing implement 89 is located on 85h of plate surfaces of the convection-current induction plate 85, and an abbreviation same side. Moreover, between the tip of cable attaching part 89b, and the perimeter of crevice 85e, the gap of extent which can insert in an optical cable 33 with allowances is formed.

[0088] The stopper 91 for supporting this convection-current induction plate 85 in the condition of having inclined in the heat dissipation unit 83 is being fixed to the side-face 83c side of the heat dissipation unit 83 by posterior part 85b of the convection-current induction plate 85. Moreover, 83d of stop holes for stopping a stopper 91 is formed in side-face 83c of the convection-current induction plate 85. The stopper 91 has the fixed part 93 which fixes this stopper 91 to the convection-current induction plate 85, as shown in drawing 27 R> 7.

[0089] The bending sections 93a and 93b which counter mutually are formed in the both sides of a fixed part 93. Box end 93c is formed among the bending sections 93a and 93b, and 93d of cavities is formed in the interior of box end 93c. The projection and the lobe 95 which penetrates bending section 93a are being fixed to the fixed part 93 free [migration] from the inside of 93d of cavities.

[0090] Moreover, the projection and the control lever 97 which penetrates bending section 93b are being fixed to the fixed part 93 free [migration] from the inside of 93d of cavities. Moreover, as shown in drawing 28 , the lobe 95 and the control lever 97 are mutually connected in 93d of cavities. Coiled spring 99 is arranged in 93d of cavities, and this coiled spring 99 is inserted in the control lever 97.

[0091] And coiled spring 99 contacted the lobe 95 in the end, and is in contact with the wall of 93d of cavities in many items. A lobe 95 is turned to side-face 83c of the heat dissipation unit 83, and coiled spring 99 is pressing it. In the condition of not operating a control lever 97, a lobe 95 is stopped by 83d of stop holes of side-face 83c of the heat dissipation unit 83, or is contacted by side-face 83c in the state of press.

[0092] Moreover, as shown in drawing 29 , by turning and drawing a control lever 97 in side-face 83c of the heat dissipation unit 83, and the opposite side, a lobe 95 moves to 93d side of cavities, and a stop with a lobe 95 and 83d of stop holes of side-face 83c is canceled. In the equipment rack for communication equipment mentioned above, extra length processing of an optical cable 33 is performed within the heat dissipation unit 83 so that it may be shown below.

[0093] Namely, first, by operating a control lever 97, a stop with 83d of stop holes of the lobe 95 of the convection-current induction plate 85 and the heat dissipation unit 83 is canceled, and as shown in drawing 30 , it changes the convection-current induction plate 85 into a level condition. Next, an optical cable 33 is introduced in the heat dissipation unit 83 from the back of an equipment rack. The introduced optical cable 33 is introduced into 85d of cable induction of the convection-current induction plate 85, and is inserted in the optical cable holder 87.

[0094] Next, along with 85f of ramps of crevice 85e, an optical cable 33 enters in crevice 85e, and is

wound around the optical cable extra length processing implement 89. Under the present circumstances, since cable attaching part 89b of the optical cable extra length processing implement 89 is located on 85h of plate surfaces of the convection-current induction plate 85, and an abbreviation same side, there is nothing that bars extra length processing of an optical cable 33 in the space which winds the upper optical cable 33 of the convection-current induction plate 85.

[0095] For this reason, even if especially the operator that performs extra length processing is not conscious, an optical cable 33 enters in crevice 85e in a self-weight along with 85f of ramps, and extra length processing is performed easily. And the tip side of the optical cable 33 which performed extra length processing is pulled out from the back of the heat dissipation unit 83, and is connected to the communication equipment 23 in the receipt unit 25.

[0096] Posterior part 85b of the convection-current induction plate 85 is raised by hand next, and the convection-current induction plate 85 rotates towards the upper part. If a lobe 95 moves to the location of 83d of stop holes of side-face 83c of the heat dissipation unit 83, the tip of a lobe 95 will be inserted in 83d of stop holes by spring operation of coiled spring 99, and it will be stopped according to it by rotation.

[0097] And as shown in drawing 25 , within the heat dissipation unit 83, the convection-current induction plate 85 holds an inclination condition, and is stopped. A stop with a lobe 95 and 83d of stop holes is canceled by on the other hand, turning and drawing a control lever 97 inside the heat dissipation unit 83 first by extension of communication equipment 23 etc., in introducing the new optical cable 33 into the heat dissipation unit 83.

[0098] If a stop with a lobe 95 and 83d of stop holes is canceled, the convection-current induction plate 85 will be turned caudad, and will rotate by self-weight until it will be in a level condition. And the new optical cable 33 is introduced in the heat dissipation unit 83, and as mentioned above, after extra length processing is carried out by the optical cable extra length processing implement 89, it connects with communication equipment 23.

[0099] After the extra length processing activity of an optical cable 33, posterior part 85b of the convection-current induction plate 85 is raised, a lobe 95 and 83d of stop holes are stopped again, and the convection-current induction plate 85 is stopped in the heat dissipation unit 83 in the state of an inclination. In the equipment rack for communication equipment constituted as mentioned above, since the stopper 91 which holds the convection-current induction plate 85 in the state of an inclination was fixed to the side-face 83a side of the heat dissipation unit 83, it becomes unnecessary to arrange the member for holding the convection-current induction plate 85 at the anterior part or the posterior part of the heat dissipation unit 83 which introduces an optical cable 33, and the opening part of the anterior part of the heat dissipation unit 83 or a posterior part can be enlarged.

[0100] For this reason, the extra length processing activity of the optical cable 33 introduced in the heat dissipation unit 83 can be easily done compared with the former. Moreover, it is fixed to the both sides of posterior part 85b of the convection-current induction plate 85 free [migration to a fixed part 93]. Since 83d of stop holes which arrange the lobe 95 which has spring nature in the direction of side-face 83c of the heat dissipation unit 83, and projects in it, and stop a lobe 95 to side-face 83c of the heat dissipation unit 83 was formed In case the convection-current induction plate 85 is changed into an inclination condition from a level condition Only by raising posterior part 85b of the convection-current induction plate 85, tip 93a of a lobe 95 can be stopped in 83d of stop holes, and the convection-current induction plate 85 can be stopped to side-face 83c of the heat dissipation unit 83, and can be easily held in the inclination condition.

[0101] And since the control lever 97 of which a stop with 83d of stop holes is canceled was connected with the lobe 95, by drawing a control lever 97 in side-face 83c of the heat dissipation unit 83, and the opposite side, easily, a stop with a lobe 95 and 83d of stop holes can be canceled, and the convection-current induction plate 85 in an inclination condition can be rotated to a level condition. Moreover, since crevice 85e which has 85f of ramps was formed in the perimeter and the optical cable extra length processing implement 89 has been arranged to the convection-current induction plate 85 at this crevice 85e In case an optical cable 33 is wound around the optical cable extra length processing implement 89,

along with 85f of ramps of crevice 85e, an optical cable 33 can enter in crevice 85e in a self-weight, and can perform extra length processing of an optical cable 33 easily in the narrow heat dissipation unit 83.
[0102] Furthermore, cable winding section 87a which winds an optical cable 33 around the optical cable extra length processing implement 89 arranged at crevice 85e of the convection-current induction plate 85, Since tabular cable attaching part 89b which extends towards a perimeter from this cable winding section 87a, and is formed on 85h of plate surfaces of the convection-current induction plate 85 and an abbreviation same side was formed By this cable attaching part 89b, the optical cable 33 which entered in crevice 85e can prevent separating from the optical cable extra length processing implement 89.
[0103] Moreover, since slit 85c was formed, a part of posterior part 85b was caudad bent to posterior part 85b of the convection-current induction plate 85 and 85d of cable induction was formed in it, an optical cable 33 can prevent it being inserted between posterior part 85b of the convection-current induction plate 85, and the back up plate 84, and being damaged. And since it formed by bending without cutting posterior part 85b of the convection-current induction plate 85, and lacking 85d of cable induction, it generates from the downward communication equipment 23, and the heat which moves along with the convection-current induction plate 85 can be certainly drawn behind the heat dissipation unit 83, without missing to the upper receipt unit 25.
[0104] Furthermore, since the convection-current induction plate 85 was stopped in the state of the inclination in the heat dissipation unit 83 by raising by hand posterior part 85b of the convection-current induction plate 85 with which an optical cable 33 is introduced, all extra length processing activities can be done from the back of the heat dissipation unit 83. Drawing 31 shows the 9th operation gestalt (it corresponds to claim 17 thru/or claim 19) of the equipment rack for communication equipment of this invention.
[0105] With this operation gestalt, guide rail 83e of the shape of radii centering on anterior part 85a of the convection-current induction plate 85 is formed in side-face 83c of the heat dissipation unit 83. The rotation roller 101 set to this guide rail 83e from the resin fixed to flank 85j of the convection-current induction plate 85 is stopped free [sliding]. As shown in drawing 32 and drawing 33 , the rotation roller 101 is formed in the end side of insertion section 101a of the cross-section circular configuration inserted in guide rail 83e, and insertion section 101a, and has flange 101b which touches side-face 83a of the heat dissipation unit 83.
[0106] Moreover, through hole 101c penetrated in the direction of axial length is formed in the rotation roller 101. The rotation roller 101 is fixed to the convection-current induction plate 85 free [rotation] through the **** member 103 inserted in through hole 101c. And the insertion section of the rotation roller 101 is inserted in guide rail 83e free [rotation].
[0107] 83f of lower limits of guide rail 83e is formed in the location higher than anterior part 85a of the convection-current induction plate 85 as shown in drawing 34 . And when the rotation roller 101 of the convection-current induction plate 85 is located in 83f of lower limits of guide rail 83e and the convection-current induction plate 85 is in a level condition, the convection-current induction plate 85 is carrying out the inclination condition that posterior part 85b inclines up, slightly.
[0108] For this reason, also when performing extra length processing of an optical cable 33, it becomes possible to miss the heat generated from the communication equipment 23 of a downward equipment unit behind the heat dissipation unit 83 along the inclination of the convection-current induction plate 85. Although the same effectiveness as the 8th operation gestalt which also mentioned above the equipment rack for communication equipment of this operation gestalt can be acquired Since the rotation roller 101 which rotates free was inserted in in guide rail 83e with this operation gestalt In case the rotation roller 101 can be more smoothly moved into guide rail 83e and it changes into the level condition or inclination condition of the convection-current induction plate 85, the convection-current induction plate 85 can be rotated smoothly.
[0109] Moreover, since 83f of lower limits of guide rail 83e was formed in the location higher than anterior part 85a of the convection-current induction plate 85 Where the convection-current induction plate 85 is leveled, in case extra length processing of an optical cable 33 is performed, the convection-current induction plate 85 can be slightly held in the inclination condition, and the heat generated from

the communication equipment 23 contained by the downward receipt unit 25 can be missed outside along the inclination of the convection-current induction plate 85.
[0110] For this reason, it can prevent that the downward receipt unit 25 is filled with heat, and extra length processing of an optical cable 33 can be performed for a long time compared with the former. In addition, although the 8th operation gestalt mentioned above described the example which carried out folding of the plate and formed the optical cable extra length processing implement 89, this invention is not limited to this operation gestalt, and may really be formed with resin etc.
[0111]
[Effect of the Invention] In the equipment rack for communication equipment according to claim 1, since the inclination maintenance device in which a convection-current induction plate was held in the state of an inclination was formed in the side-face side of a heat dissipation unit and it becomes unnecessary to arrange the member for holding a convection-current induction plate at the anterior part or the posterior part of a heat dissipation unit which introduces an optical cable, the opening part of the anterior part of a heat dissipation unit or a posterior part can be enlarged.
[0112] For this reason, extra length processing of the optical cable introduced in a heat dissipation unit can be performed easily. At the equipment rack for communication equipment according to claim 2, since the rotation member is arranged free [rotation] in the vertical direction focusing on the supporting-point section of a rotation member and the back end section of this rotation member was stopped free [rotation] at the posterior part of a convection-current induction plate, a convection-current induction plate can be easily changed into an inclination condition or a level condition by the simple device by rotation actuation of a rotation member.
[0113] Moreover, since it had the fixed device fixed to the front end section of a rotation member for the front end section and the pars basilaris ossis occipitalis of a heat dissipation unit, enabling free attachment and detachment, the inclination condition of a convection-current induction plate can be easily held according to this fixed device. In the equipment rack for communication equipment according to claim 3, since the back end section of a rotation member and the posterior part of a convection-current induction plate were stopped free [sliding], a rotation member and a convection-current induction plate can be rotated easily, without applying the impossible force.
[0114] In the equipment rack for communication equipment according to claim 4, since the supporting-point section of a rotation member and the supporter material of a heat dissipation unit were stopped free [sliding], a rotation member and a convection-current induction plate can be rotated easily, without applying the impossible force. In the equipment rack for communication equipment according to claim 5, since the anterior part of a convection-current induction plate and the pars basilaris ossis occipitalis of a heat dissipation unit were stopped free [sliding], a rotation member and a convection-current induction plate can be rotated easily, without applying the impossible force.
[0115] At the equipment rack for communication equipment according to claim 6, since the rotation member is arranged on both sides of a heat dissipation unit and each front end section of this rotation member was connected by the long picture-like connection member, a rotation member can be easily rotated by operating a connection member up and down. Moreover, by the rotation member, without leaning a convection-current induction plate to right and left, since the convection-current induction plate was supported from both sides, it is stabilized and can change into a level condition or an inclination condition.
[0116] In the equipment rack for communication equipment according to claim 7, since the connection member was formed by the rod part material of a cross-section circular configuration, front opening of a heat dissipation unit can be formed widely, and extra length processing of an optical cable can be performed easily. In the equipment rack for communication equipment according to claim 8, since predetermined spacing was formed between the connection member and the convection-current induction plate while changing the convection-current heat sink into the inclination condition, an optical cable can prevent it being inserted between a connection member and a convection-current induction plate, and being damaged.
[0117] In the equipment rack for communication equipment according to claim 9, form the bending

section of a concave configuration in rod part material, and since it connected with the rotation member free [rotation], this rod part material With respect to the level condition of a convection-current heat sink, and an inclination condition, there is nothing and it can prevent certainly always being able to contact the bending section of rod part material to a convection-current heat sink with a self-weight, and an optical cable being inserted between rod part material and a convection-current induction plate, and being damaged.

[0118] In the equipment rack for communication equipment according to claim 10, since the bend of predetermined radius of curvature was formed in the anterior part of a convection-current induction plate, the optical cable drawn from a heat dissipation unit by this bend towards a receipt unit can be held to predetermined radius of curvature. In the equipment rack for communication equipment according to claim 11, since the covering member corresponding to the configuration of a bend has been arranged free [attachment and detachment] ahead [of a bend], the optical cable drawn from a heat dissipation unit by this covering member and bend towards a receipt unit can be more certainly held to predetermined radius of curvature.

[0119] At the equipment rack for communication equipment according to claim 12, since the buffer member has been arranged between the anterior part of a convection-current induction plate, and the pars basilaris ossis occipitalis of a heat dissipation unit, in case a convection-current induction plate is rotated to the pars-basilaris-ossis-occipitalis side of a heat dissipation unit, rapid rotation of a convection-current induction plate can be prevented, the rapid force can join the optical cable by which extra length processing is carried out on the convection-current induction plate, and it can prevent that an optical cable is damaged.

[0120] The holddown member arranged in the equipment rack for communication equipment according to claim 13 at the both sides of the posterior part of a convection-current induction plate, By the lobe material which is fixed to a holddown member, has spring nature in the direction of a side face of a heat dissipation unit, and projects in it, and the stop section which stops this lobe material on the side face of a heat dissipation unit, since the inclination maintenance device was made the configuration In case a convection-current induction plate is changed into an inclination condition from a level condition, only by raising the posterior part of a convection-current induction plate, the tip of lobe material can be stopped in the stop section, and a convection-current induction plate can be stopped on the side face of a heat dissipation unit, and can be easily held in the inclination condition.

[0121] In the equipment rack for communication equipment according to claim 14, since the operating member of which a stop with a stop hole is canceled was fixed to lobe material, by drawing an operating member in the side face and the opposite side of a heat dissipation unit, easily, a stop with lobe material and a stop hole can be canceled, and the convection-current induction plate in an inclination condition can be rotated to a level condition. In the equipment rack for communication equipment according to claim 15, since the crevice which has an inclination was formed in the perimeter, the optical cable extra length processing implement has been arranged to this crevice and an optical cable enters in a crevice in a self-weight along the inclination of a crevice in case an optical cable is wound around an optical cable extra length processing implement, extra length processing of an optical cable can be easily performed to a convection-current induction plate in a narrow heat dissipation unit.

[0122] The cable winding section which winds an optical cable around the optical cable extra length processing implement arranged in the crevice of a convection-current induction plate in the equipment rack for communication equipment according to claim 16, It extends towards a perimeter from this cable winding section, and since the tabular cable attaching part formed on the plate surface of a convection-current induction plate and an abbreviation same side was formed, the optical cable wound around the cable winding section can prevent separating from an optical cable extra length processing implement by the cable attaching part.

[0123] In the equipment rack for communication equipment according to claim 17, since the interior material of a proposal which forms a radii-like slot and is inserted in the posterior part side of the side face of a heat dissipation unit for this slot, enabling free sliding was fixed to the flank of a convection-current induction plate, in case a heat dissipation induction plate is rotated in a level condition or the

inclination condition, it can prevent that a heat dissipation induction plate inclines in the direction of both sides, and can always rotate equally.

[0124] For this reason, in case a heat dissipation induction plate is rotated, a heat dissipation induction plate can prevent being caught in the side face of a heat dissipation unit. In the equipment rack for communication equipment according to claim 18, since the lower limit of a guide rail was formed in the location higher than the anterior part of a convection-current induction plate Where a convection-current induction plate is leveled, in case extra length processing of an optical cable is performed Along with the pars-basilaris-ossis-occipitalis side of a heat dissipation unit, a convection-current induction plate can be slightly held in the inclination condition, and the heat generated from the equipment contained by the downward receipt unit can be missed outside along the inclination of a convection-current induction plate.

[0125] For this reason, it can prevent that a downward receipt unit is filled with heat, and extra length processing of an optical cable can be performed for a long time compared with the former. In the equipment rack for communication equipment according to claim 19, since the rotation section which rotates the inside of a guide rail free was formed in the perimeter of the interior material of a proposal, in case the interior material of a proposal can be moved into a guide rail and it changes into the level condition or inclination condition of a convection-current induction plate more smoothly, a heat dissipation induction plate can be rotated smoothly.

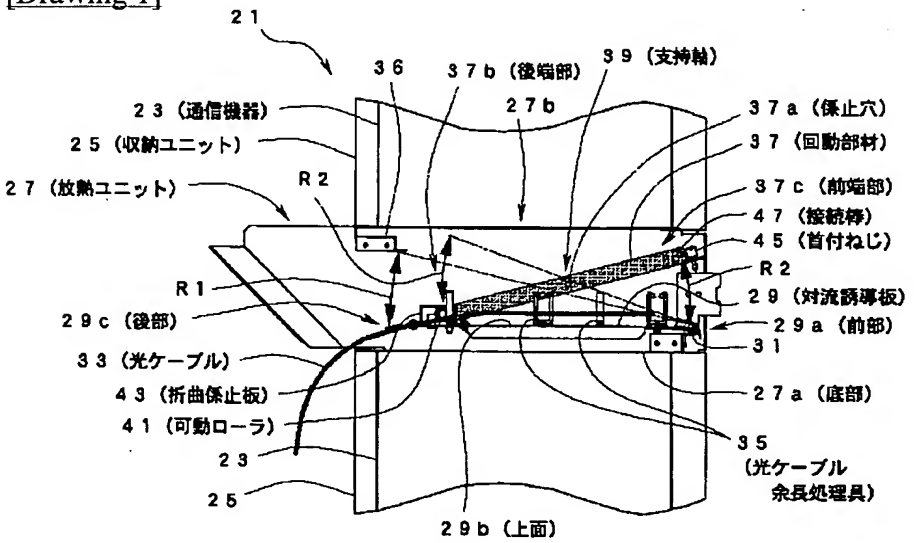
[Translation done.]

* NOTICES *

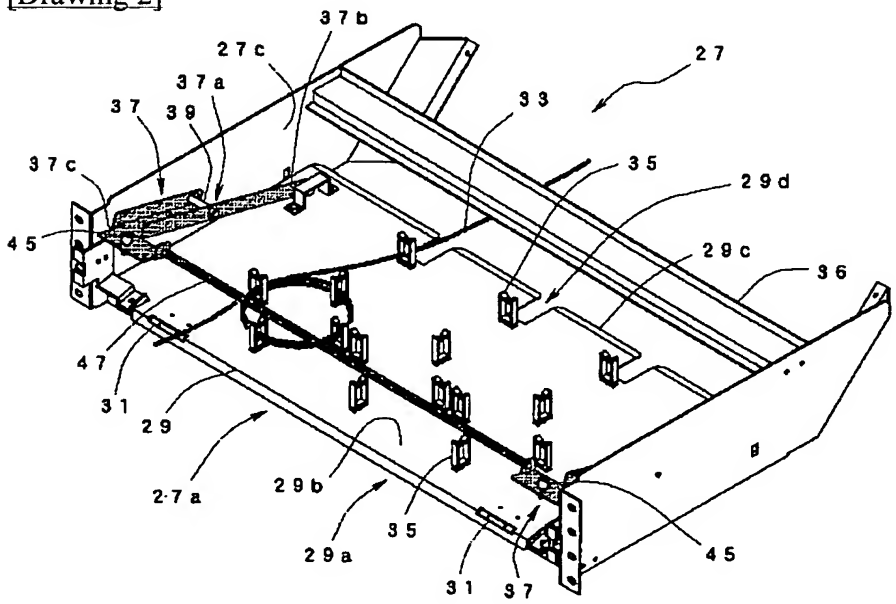
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

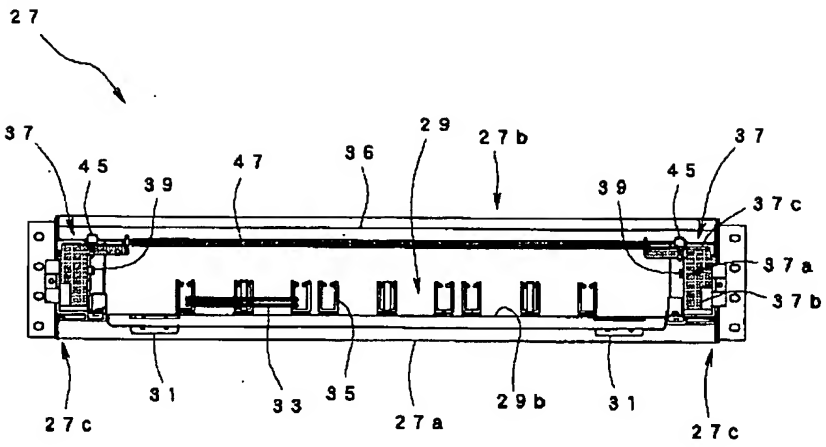
[Drawing 1]



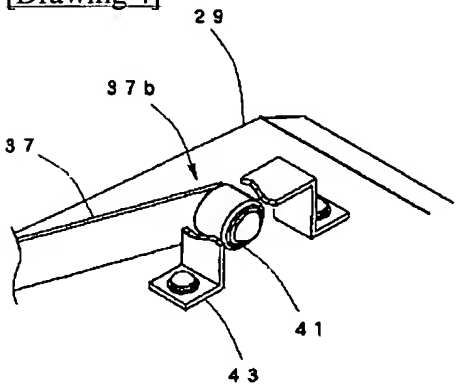
[Drawing 2]



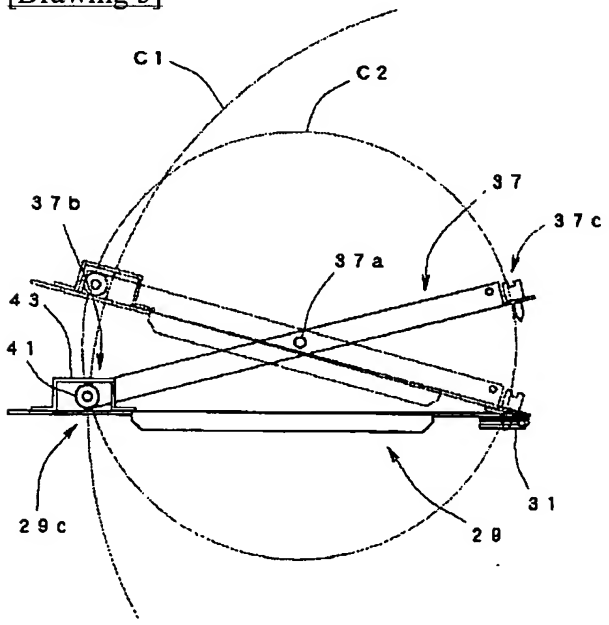
[Drawing 3]



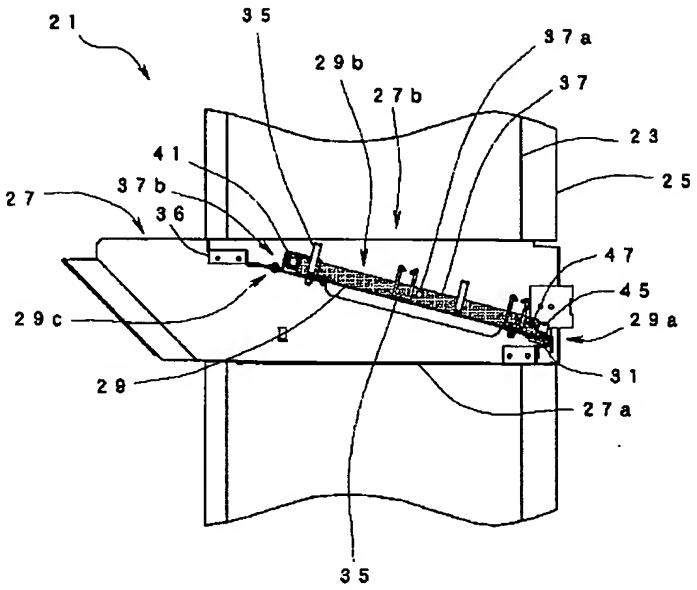
[Drawing 4]



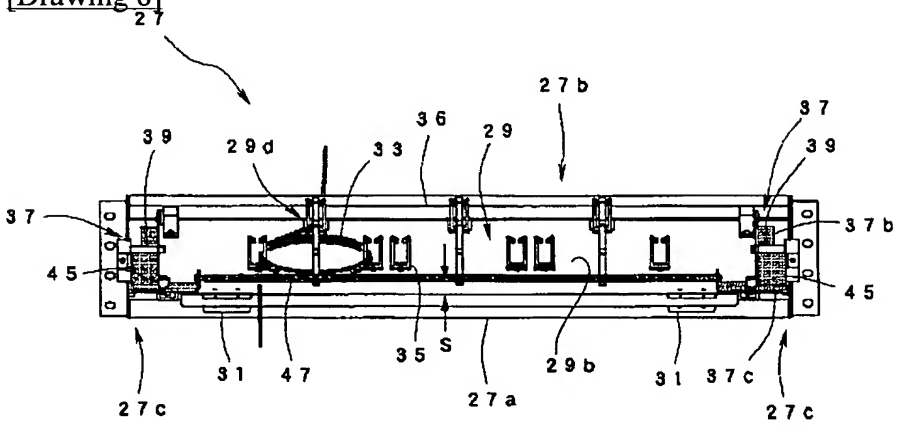
[Drawing 5]



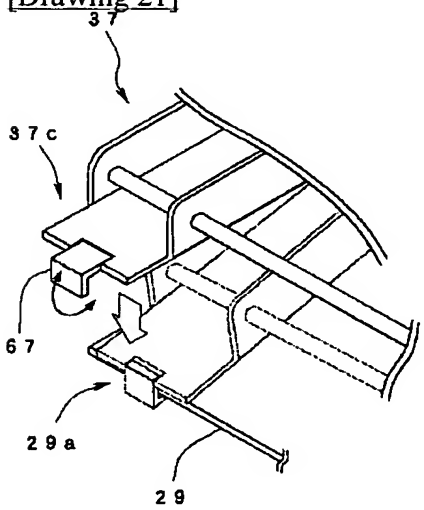
[Drawing 6]



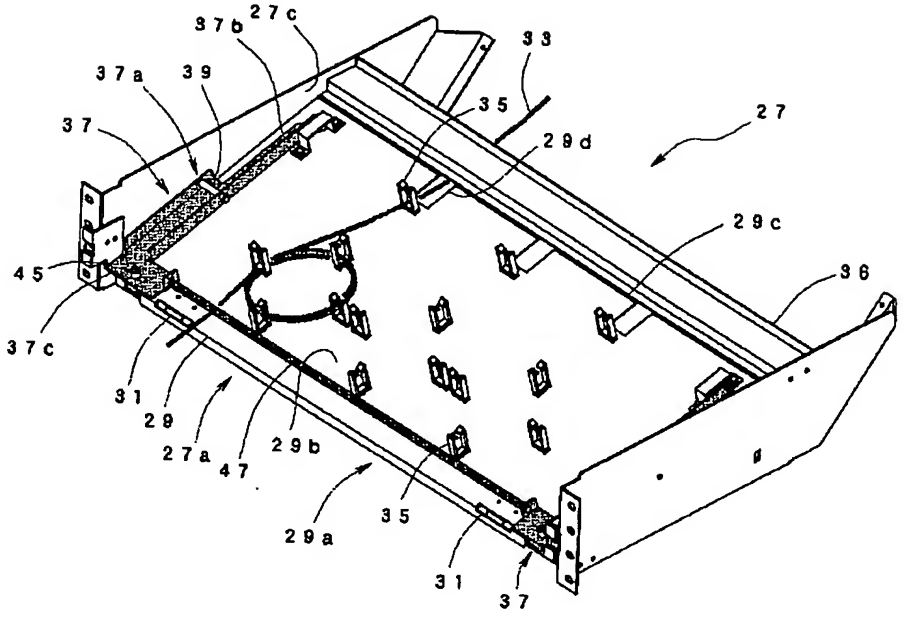
[Drawing 8]



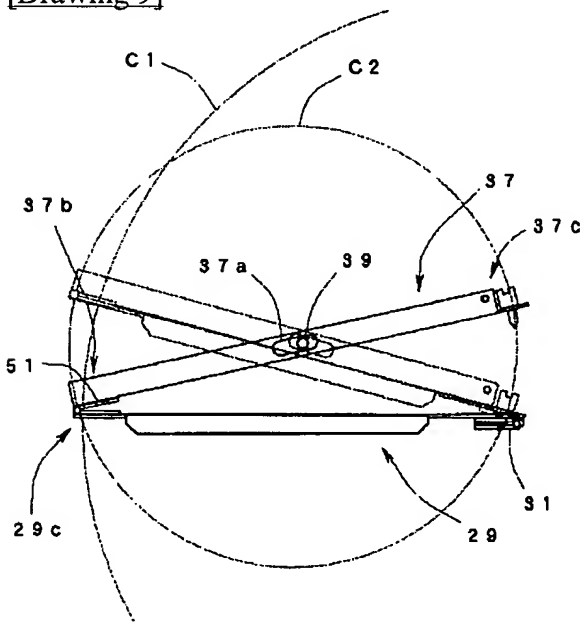
[Drawing 21]



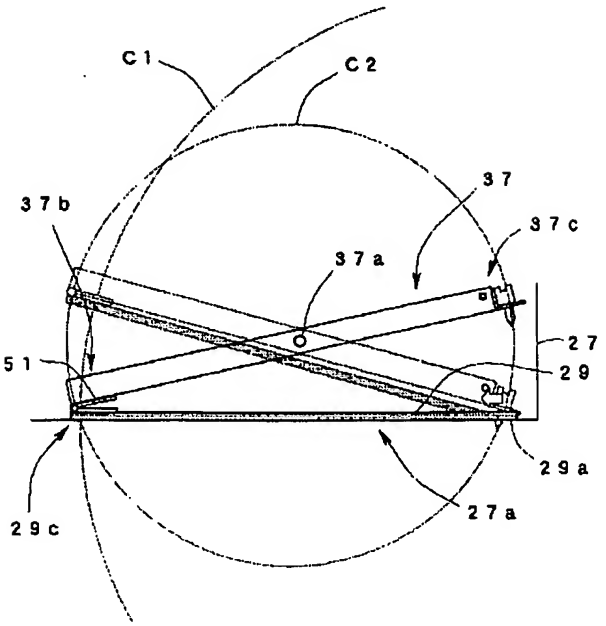
[Drawing 7]



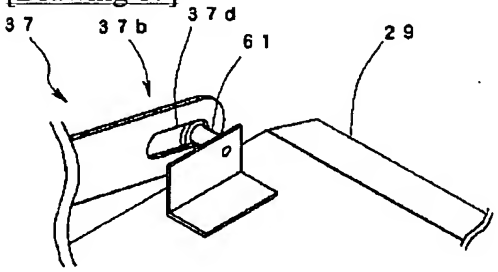
[Drawing 9]



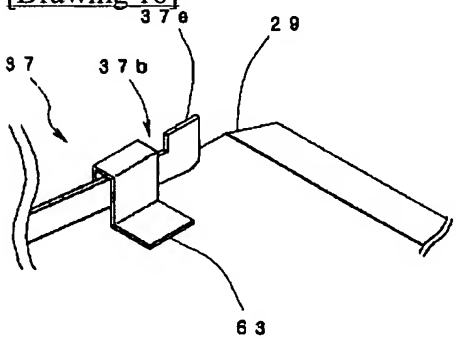
[Drawing 10]



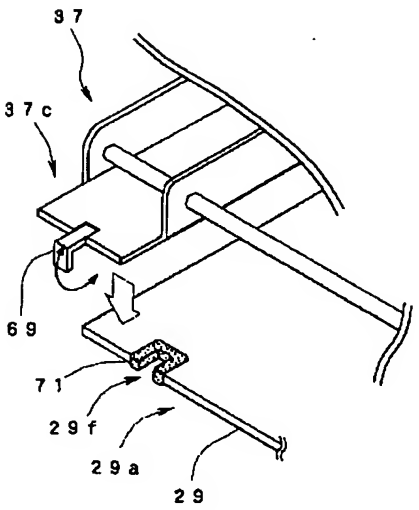
[Drawing 17]



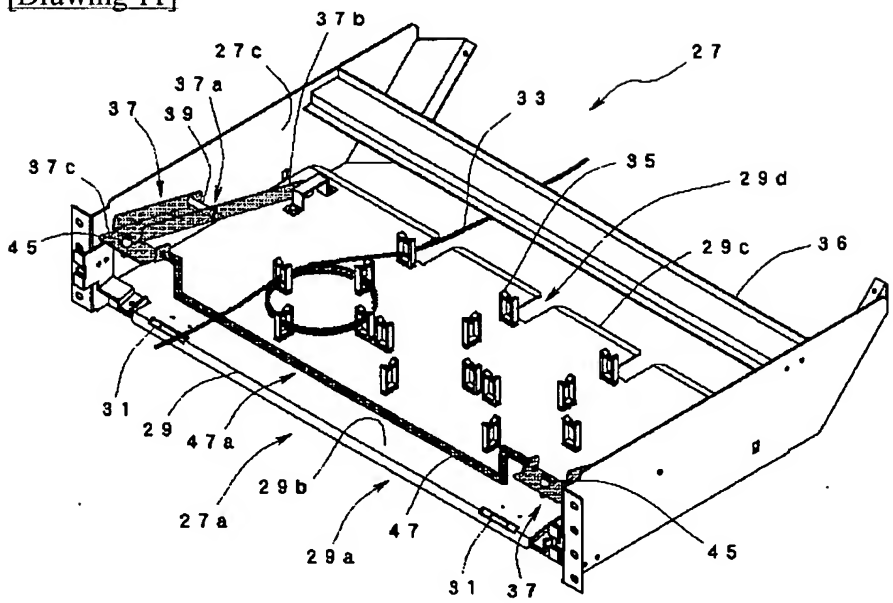
[Drawing 18]



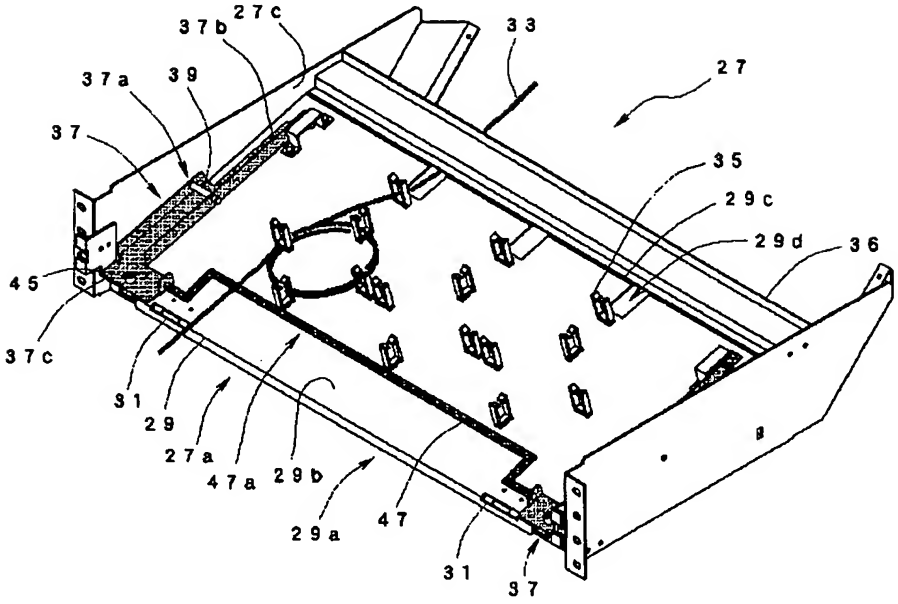
[Drawing 22]



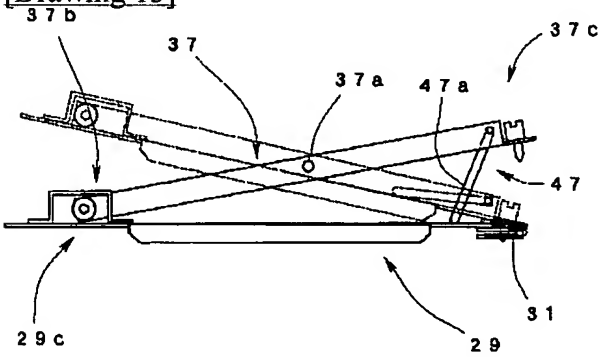
[Drawing 11]



[Drawing 12]



[Drawing 13]



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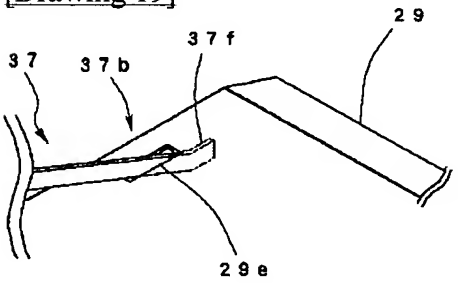
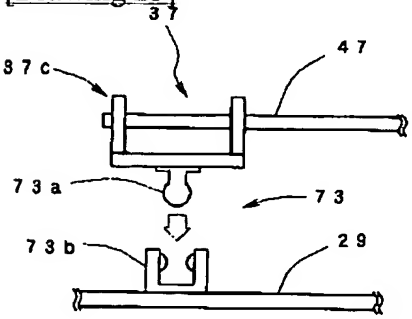
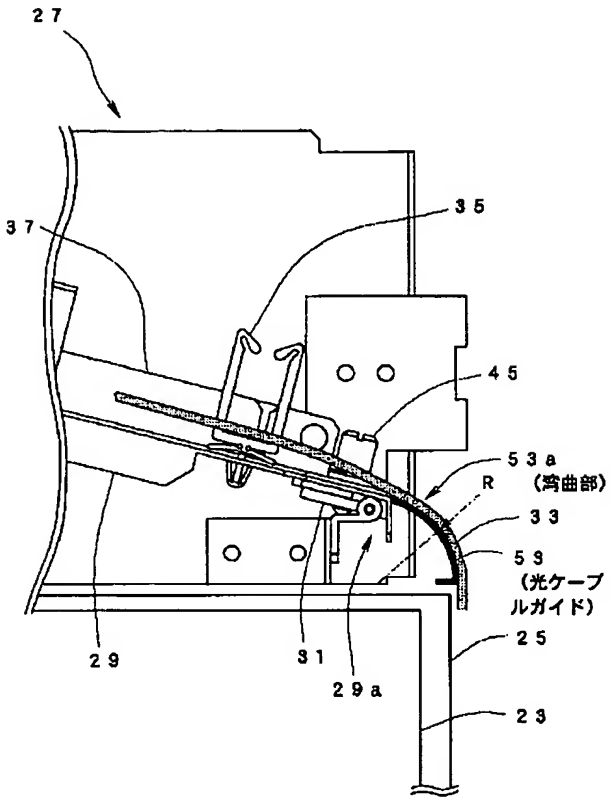


[Drawing 23]



[Drawing 14]



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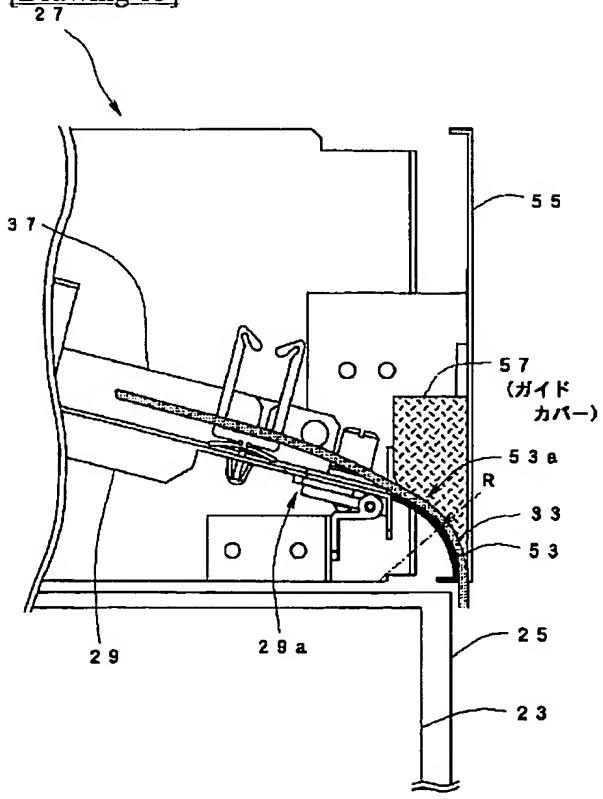

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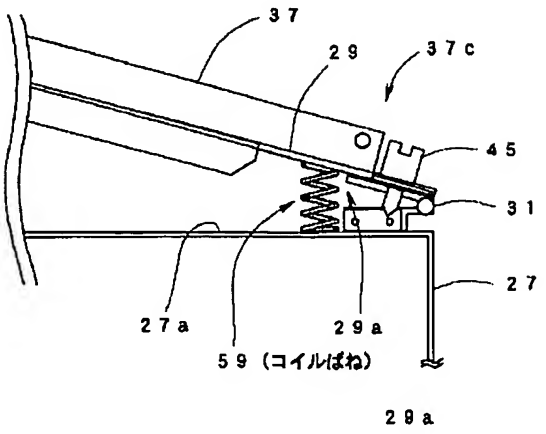

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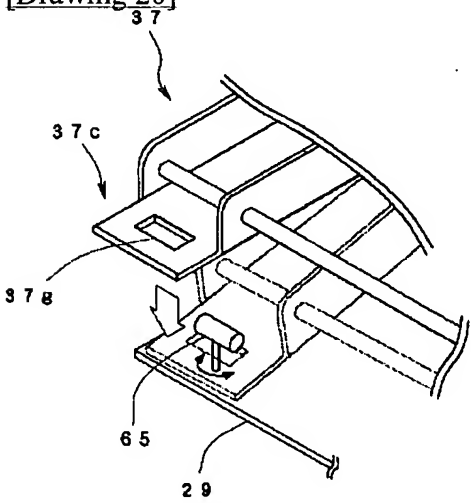

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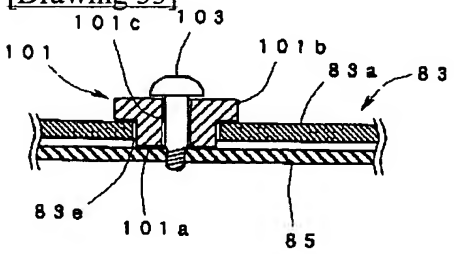

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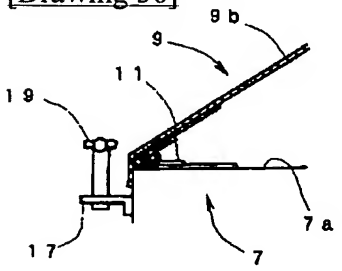

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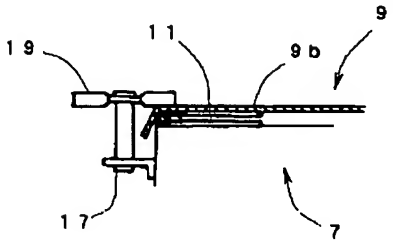

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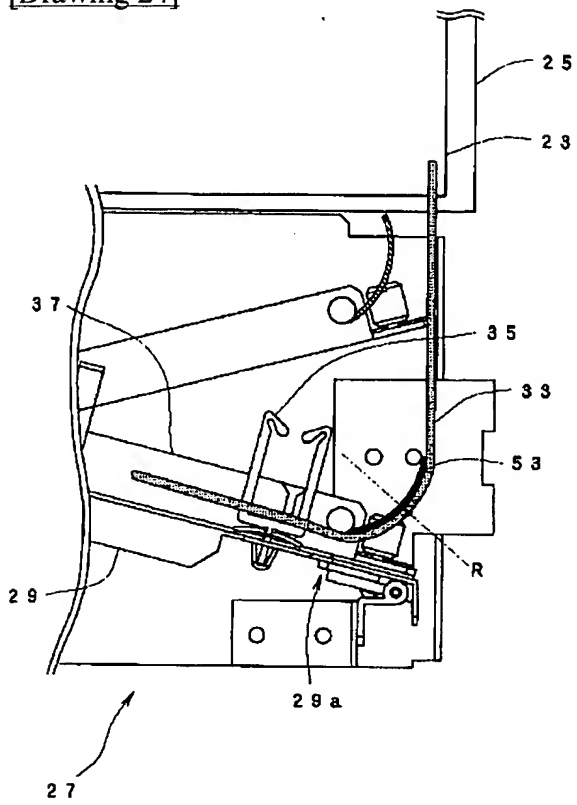

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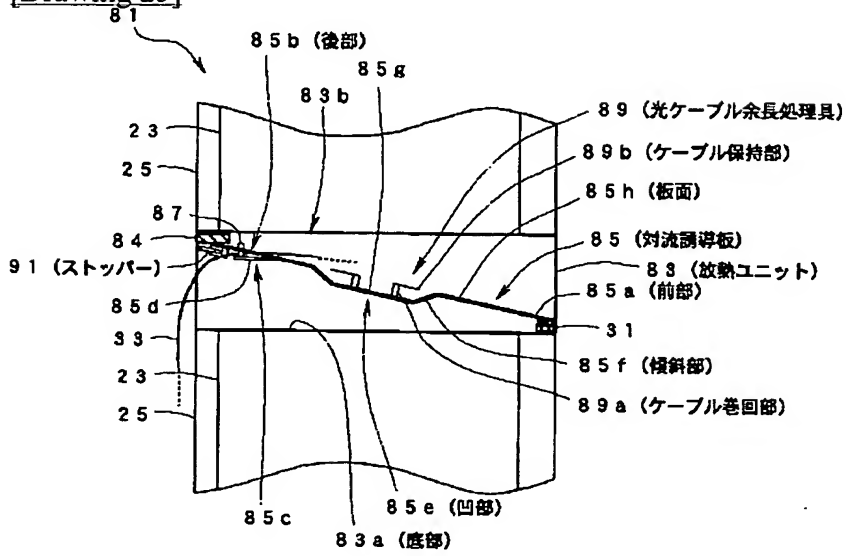

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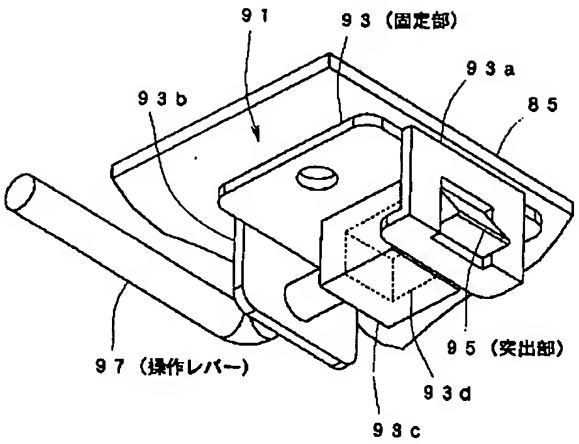

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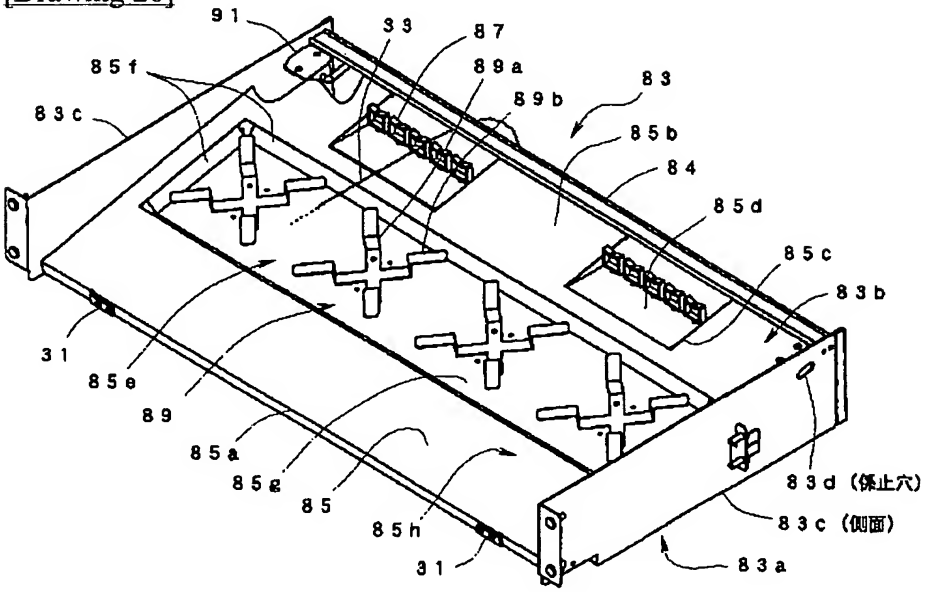

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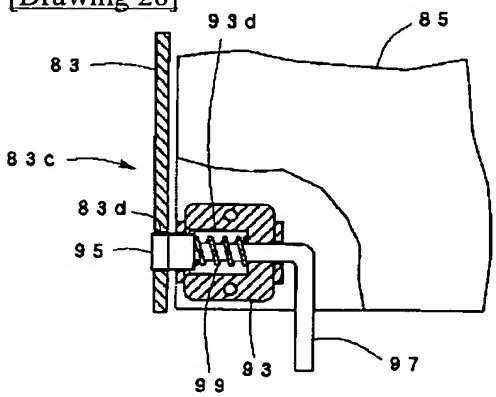
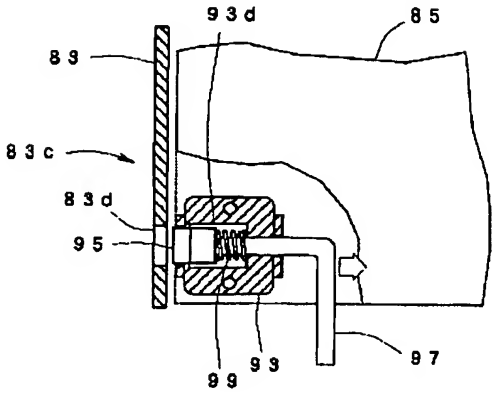
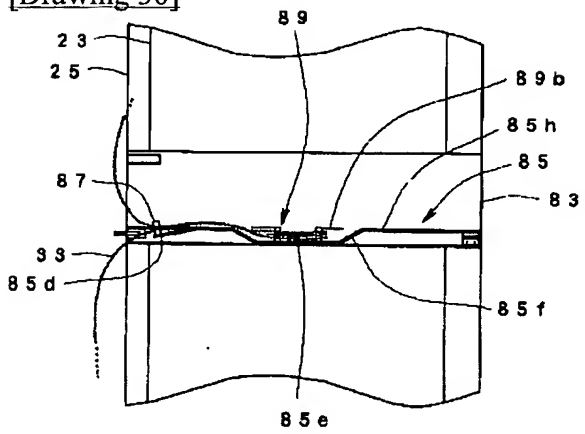


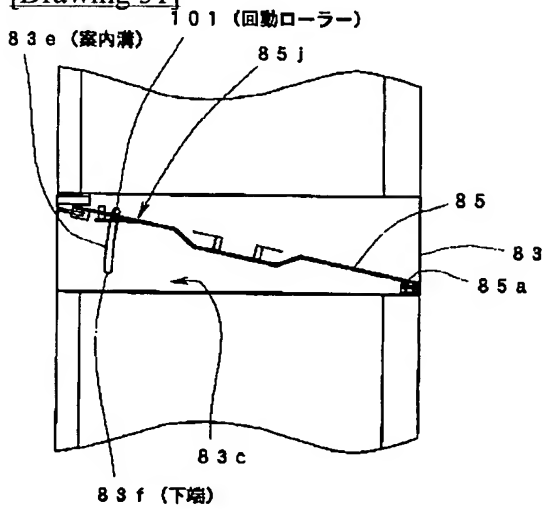
[Drawing 29]



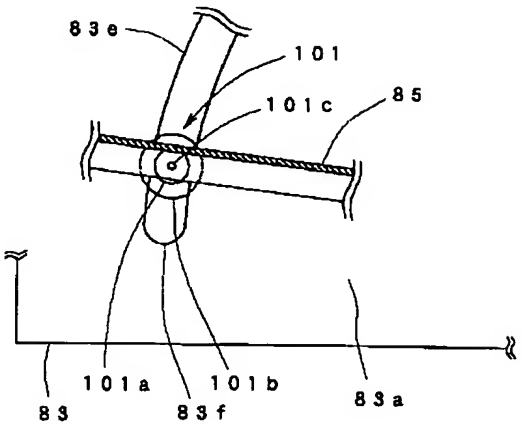
[Drawing 30]



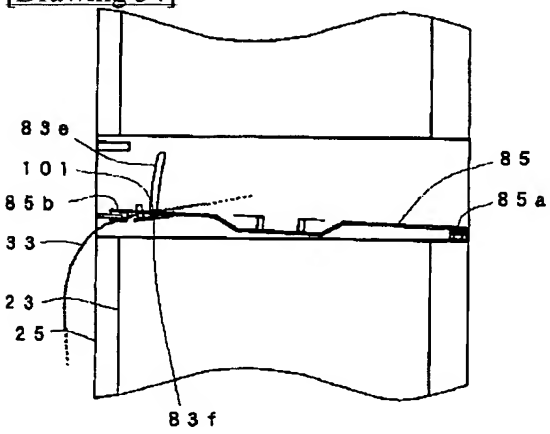
[Drawing 31]



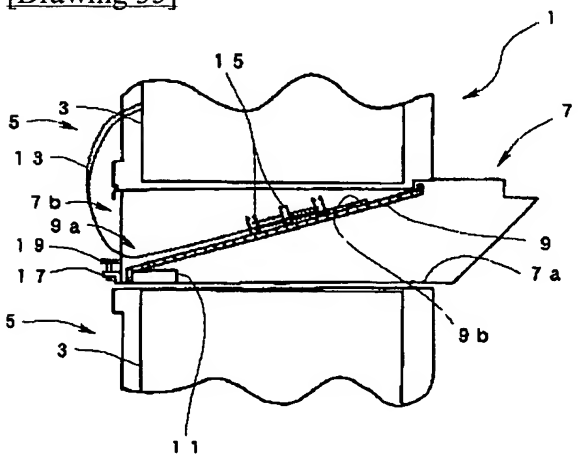
[Drawing 32]



[Drawing 34]



[Drawing 35]



[Translation done.]